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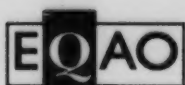
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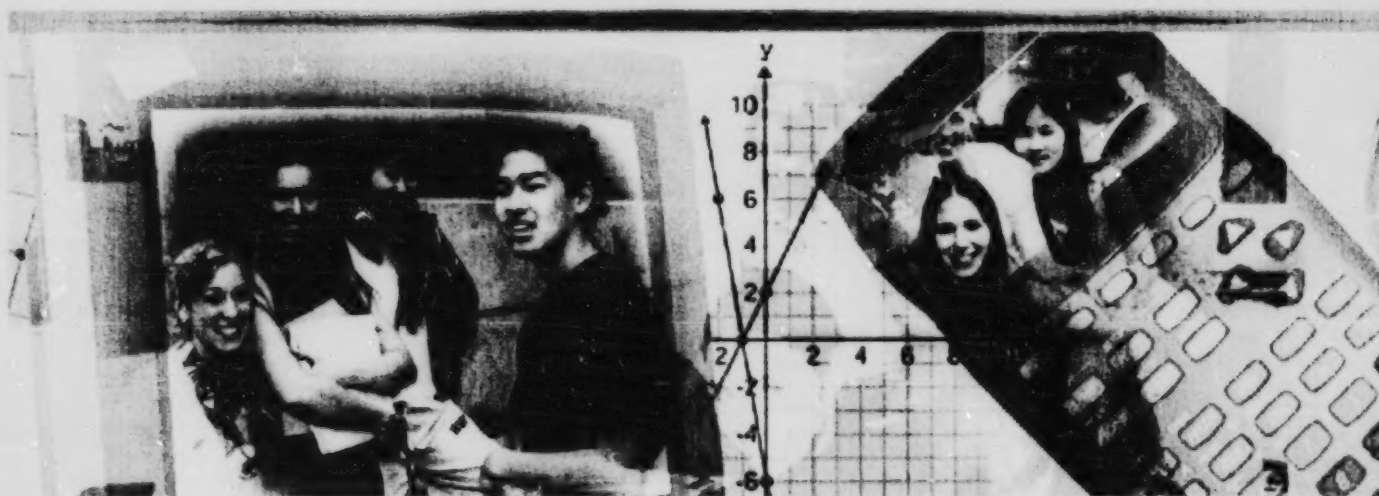


Education
Quality and
Accountability
Office

Ontario Provincial Report on Achievement

2000–2001

English-Language Secondary Schools



**Ontario Provincial Report
on Achievement**

2000-2001

Secondary Schools



Education
Quality and
Accountability
Office

Ontario Provincial Report on Achievement
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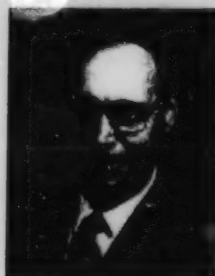
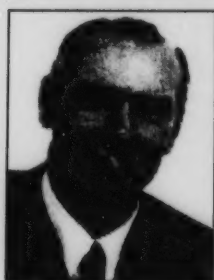
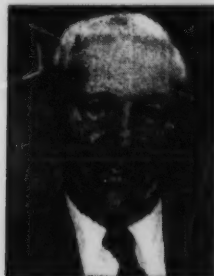
The Education Quality and Accountability Office
2 Carlton Street, Suite 1200
Toronto, ON M5B 2M9

Telephone: 1-888-327-7377

Web site: www.eqao.com

Note: In this report, the word "parent" is used to refer to a parent, legal guardian or any other person who acts as a caregiver.

The Board of Directors



The Board of Directors,
from left to right, Peter
Ross (Chair), Bette
Stephenson, Bob Bonisteel,
Martin Cugelman, Dominic
Giroux, Maureen Kempston
Darkes, Jerry Ponikvar,
Doretta Wilson.



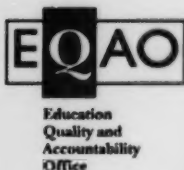
In Memoriam

Dr. Robert (Bob) Surtees, the Chair of EQAO's Board of Directors, passed away suddenly on Saturday, August 25, 2001. Dr. Surtees was appointed to the Board of Directors in February 1997 and had served as Chair for the last two years.

Dr. Surtees was Professor of History at Nipissing University in North Bay and had been a member of the Faculty of Arts and Science since 1967.

On behalf of the Board of Directors, Vice Chair Dr. Bette Stephenson paid tribute to Dr. Surtees, stating, "Robert was a strong supporter of public education in the province and contributed immensely to the agency's work. An optimist by nature, he was always generous and outgoing. His leadership and sense of humour will be missed dearly by his colleagues on the Board and the EQAO staff."

EQAO's Board of Directors dedicates this report to the memory of Dr. Robert Surtees.



Suite 1200
2 Carlton St.
Toronto, ON M5B 2M9
Telephone: 1-888-327-7377

November 2, 2001

Honourable Janet Ecker
Minister of Education
900 Bay Street
Mowat Block, 22nd Floor
Toronto, Ontario
M7A 1L2

Dear Minister:

The Board of Directors of the Education Quality and Accountability Office (EQAO) is pleased to present the fifth annual *Ontario Provincial Report on Achievement*. This report, like its predecessors, provides an overview of student achievement across the province. The Individual Student Reports and the school and board reports contain more detailed information for parents, students, educators and Ontario's communities.

In 2000-2001, EQAO conducted four province-wide assessments: the annual Grade 3 and Grade 6 Assessments of Reading, Writing and Mathematics and, at the secondary level, the new Grade 9 Assessment of Mathematics and a trial administration of the Ontario Secondary School Literacy Test (OSSLT). This year, the *Provincial Report* consists of two sections, to be released separately: an elementary section, which presents data from the Grade 3 and Grade 6 assessments, and a secondary section, which for the first time presents data from the annual Grade 9 assessment. (Data from the October 2000 trial administration of the OSSLT were released earlier.) The secondary section also contains Ontario student achievement data from the Third International Mathematics and Science Study Repeat Project (TIMSS-R), which involved Grade 8 students.

Now that the two annual secondary assessments are in place, we will be able to provide good, reliable information on how well students are meeting the provincial curriculum expectations in key subject areas from as early as Grade 3 and right up to secondary school. As a result, educators, parents and Ontario's communities will be able to track improvements in student achievement over time and across the elementary and secondary grades.

We trust that you, parents, students, educators, policy makers and Ontarians, will find the information in this report insightful, challenging and useful for the purpose of school and system improvement.

Bette Stephenson,
Vice Chair

Bob Bonisteel

Martin Cugelman

Dominic Giroux

Maureen Kempston
Darkes

Jerry Ponikvar

Doretta Wilson

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Vice Chair's Message

The annual *Ontario Provincial Report on Achievement* provides a clear and informative picture of student achievement in reading, writing and mathematics.

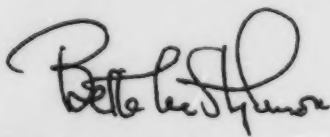
To accommodate data from the new Grade 9 Assessment of Mathematics, we are releasing the Provincial Report in two sections, elementary and secondary, this year. This secondary section of the report contains a great deal of new information about Grade 9 students' achievement in mathematics and about the context of mathematics education at the secondary level. This information will give parents, policy makers and educators much to think about and much to act on in the short-, medium- and long-terms.

EQAO is in its sixth year of province-wide assessment. There is now a strong culture of assessment in Ontario and a widespread recognition that accountability and improvement go hand in hand.

Schools have an obligation to report to parents and their communities on how well students are meeting the expectations in the provincial curriculum. At the same time, parents, policy makers and all communities, including the media, have a reciprocal obligation to use this information responsibly to make the school system better for all students. There is nothing to be gained from ranking schools or making simplistic comparisons that ignore the many factors that contribute to student achievement in each school.

In this changing world, parents and all Ontarians have high expectations for our schools. At the same time, in striving to meet these expectations, schools have the right to expect commitment and support from parents and our communities. Our students need teachers who are highly trained and motivated, families that are supportive and involved, and communities that are interested and prepared to invest in the publicly-funded education system over the long-term.

The recommendations we have made in the secondary section of this report highlight the steps that teachers, principals, parents, schools, school boards and everyone in the education community must take to improve student achievement in mathematics and to give all young people the opportunities, direction and support they need and deserve.



Bette M. Stephenson



Bette Stephenson

Education Quality and Accountability Office (EQAO)

ROLE

EQAO promotes greater accountability and better quality in Ontario's publicly funded school system. An arm's-length agency of the provincial government, EQAO provides parents, teachers and the public with accurate and reliable information about student achievement.

EQAO also makes recommendations for improvement that educators, parents, policy-makers and others in the education community can use to improve learning and teaching.

Responsibilities

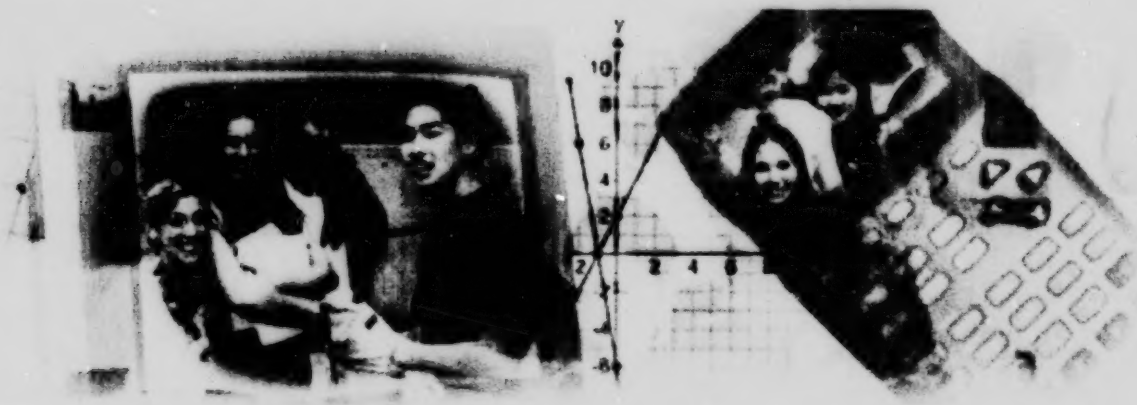
- To conduct province-wide tests of elementary and secondary school students
- To coordinate Ontario's participation in national and international assessments
- To administer a provincial Education Quality Indicators Program (EQUIP) to strengthen school board accountability
- To report to parents and the public about student achievement and education quality in Ontario
- To make recommendations for school and system improvement

Values

- EQAO values the well-being of learners above all other interests.
- EQAO values only that information which has the potential to bring about constructive change and improvement.
- EQAO values the dedication and expertise of Ontario's educators and works to involve them in all of its activities.
- EQAO values the delivery of its programs and services with equivalent quality in both English and French.

Approach

- Assess students' achievement in different subject areas and at key stages in their schooling
- Assess students' achievement against the expectations in the provincial curriculum
- Analyze data on student achievement and the learning environment inside and outside the school to determine where progress is being made and where gaps need to be closed
- Prepare materials and provide opportunities that teachers can use to enhance their skills and expertise in assessment
- Report to parents, students, educators and the public about student achievement and education quality
- Make recommendations for improvement
- Monitor improvements in student achievement over time to identify areas of strength and areas requiring further attention
- Support a culture of assessment through ongoing testing, research and administration of a quality indicators program



Education Quality Indicators Program (EQUIP)

Background

EQAO established the Education Quality Indicators Program (EQUIP) in 1998.

One of EQUIP's main purposes is to give parents, educators and the public an in-depth picture of the factors inside and outside the school that contribute to achievement. With this additional contextual information, educators and parents will be able to take their interpretations and analyses of EQAO assessment results a step further and draw more precise conclusions about the changes that need to be made in order to enhance learning and teaching.

EQUIP data for schools, school boards and the province as a whole are collected, analyzed and reported at the provincial, board and school levels.

Method

EQUIP consists of a set of indicators that provide information under seven themes.

EQUIP provides data on indicators at both the elementary level and the secondary level. EQAO gathers the data for EQUIP from three sources:

- a) Questionnaires distributed as part of the annual province-wide EQAO assessments;
- b) Other questionnaires designed to address specific indicators;
- c) the Ministry of Education, Statistics Canada and other organizations.

Further information about EQUIP, including background on the themes and indicators, is available on the EQAO Web site at www.eqao.com.

A complete list of themes and indicators follows.

Status

In early December, each school and school board will release data on the indicators listed in the chart on the following page. These data were collected through the first full application of EQUIP in 2000-2001.

Schools and school boards will be able to incorporate EQUIP data into school and school board profiles and to use the indicator data over time to enhance their improvement planning.

School and school board data, together with data for the province as a whole, will also be available on the EQAO Web site starting in January.

2000-2001 EQUIP Indicators

<i>Theme</i>	<i>Elementary School Indicator(s)</i>	<i>Secondary School Indicator(s)</i>
A. Community, Student and Family Demographics	1. Student enrollment (total enrollment and enrollment by grade) 2. Socio-economic status (family income levels) 3. Parental educational attainment 4. Student language background (language spoken at home, ESL enrollment, length of time lived in Canada) 5. Categories of students with special needs (behavioral, communicative, intellectual, physical or requiring multiple service supports) 6. Student mobility (number of schools a student has attended since Grade 1)	1. Student enrollment (total enrollment and enrollment by grade) 2. Socio-economic status (family income levels) 3. Parental educational attainment 4. Student language background (language spoken at home, ESL enrollment, length of time lived in Canada) 5. Categories of students with special needs (behavioral, communicative, intellectual, physical or requiring multiple service supports)
B. Preparedness to Learn and Early Learning Support	7. Student attendance in nursery school or kindergarten	
C. School Leadership	8. School leadership, planning and decision-making	6. School leadership, planning and decision-making
D. School Climate	9. School safety 10. Class size and organization 11. Support personnel 12. Types of special education programs available	7. School safety 8. Class size and organization 9. Support personnel 10. Types of special education programs available
E. Community-School Relationships	13. Community-school relationships	11. Community-school relationships
F. Teaching and Learning Environment	14. Time distribution for reading, writing and mathematics activities 15. Accessibility of instructional materials 16. Availability of assessment materials 17. Availability of computers 18. Teacher professional development, planning and collaboration 19. Parental involvement 20. Teacher qualifications and experience	12. Teacher qualifications and experience
G. Student achievement	21. Student achievement on EQAO's province-wide assessments	

EQAO Assessment Activities

Provincial

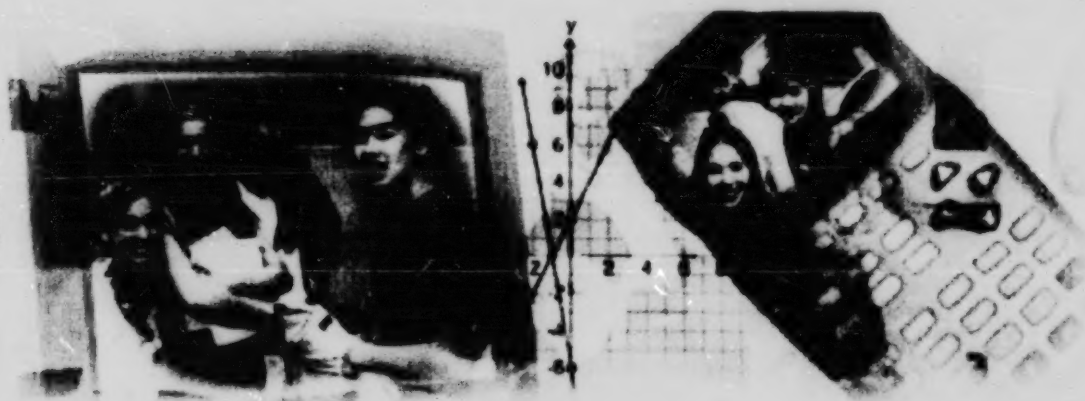
<i>Assessment</i>	<i>Population</i>	<i>Subject(s)</i>	<i>Details</i>
Grade 3 Assessment of Reading, Writing and Mathematics	All Grade 3 students	Reading, writing and mathematics	• Annual assessment held in May • Individual results released in September; school, school board and provincial results released in October/November
Grade 6 Assessment of Reading, Writing and Mathematics	All Grade 6 students	Reading, writing and mathematics	• Annual assessment held in May • Individual results released in September; school, school board and provincial results released in October/November
Grade 9 Assessment of Mathematics	All Grade 9 students enrolled in applied or academic mathematics programs	Mathematics	• Annual assessment held in January for first-semester students and in June for full-year and second-semester students • Individual results released in early fall; school, school board and provincial results released in October/November
Ontario Secondary School Literacy Test	All Grade 10 students working towards a high school diploma	Reading and writing	• Annual assessment held in October • Individual results released in February; school, school board and provincial results released in October/November • Students can retake the test during the following administration

National

<i>Assessment</i>	<i>Population</i>	<i>Subject(s)</i>	<i>Details</i>
School Achievement Indicators Program (SAIP)	Random sample of 13- and 16-year-old students	Mathematics	• Assessment conducted in April/May 2001 • Results due 2002
School Achievement Indicators Program (SAIP)	Random sample of 13- and 16-year-old students	Writing	• Assessment conducted in April/May 2002 • Results due 2003

International

<i>Assessment</i>	<i>Population</i>	<i>Subject(s)</i>	<i>Details</i>
Second Information Technology in Education Study (SITES) Module 2	Four Ontario Schools (3 anglophone and 1 francophone) selected as part of a Canadian study	Case studies of school sites displaying exemplary innovative teaching practices using computer technology	• Case studies conducted 2000-2001 • Results due 2002
Organization for Economic Co-operation and Development's (OECD) Programme for International Student Assessment (PISA)	Random sample of 15-year-old students	Reading (major subject) Mathematics and science (minor subjects)	• Assessment conducted in April/May 2000 • Results due December 2001
Progress in International Reading Literacy Study (PIRLS)	Random sample of 9-year-old students	Reading literacy	• Assessment conducted in spring 2001 • Results due 2002



Ontario Secondary School Literacy Test

The purpose of the Ontario Secondary School Literacy Test (OSSLT) is to ensure that students have acquired the essential reading and writing skills that apply in all subject areas in the provincial curriculum up to the end of Grade 9.

All students who are working towards an Ontario Secondary School Diploma (OSSD) are required to take the test in Grade 10.

Test Development and Content

EQAO is responsible for all aspects of the test — for designing, developing, administering and marking the test, reporting the results and making recommendations for school and system improvement. EQAO develops parallel versions of the test for English- and French-language schools. EQAO assessment experts work in collaboration with Ontario educators to develop, pilot and field-test reading passages and questions and writing prompts.

The test is divided into two parts: reading and writing. In the reading portion, students have to read a number of short passages and respond to two types of questions: short answer and multiple-choice. In the writing portion, students must write a summary, a paragraph, a short report and a series of paragraphs supporting an opinion.

Reporting of Results

Every student who writes the test receives an Individual Student Report. In addition, students who do not complete the test successfully receive more detailed feedback on skills that require attention. EQAO also releases provincial, school board and school results.

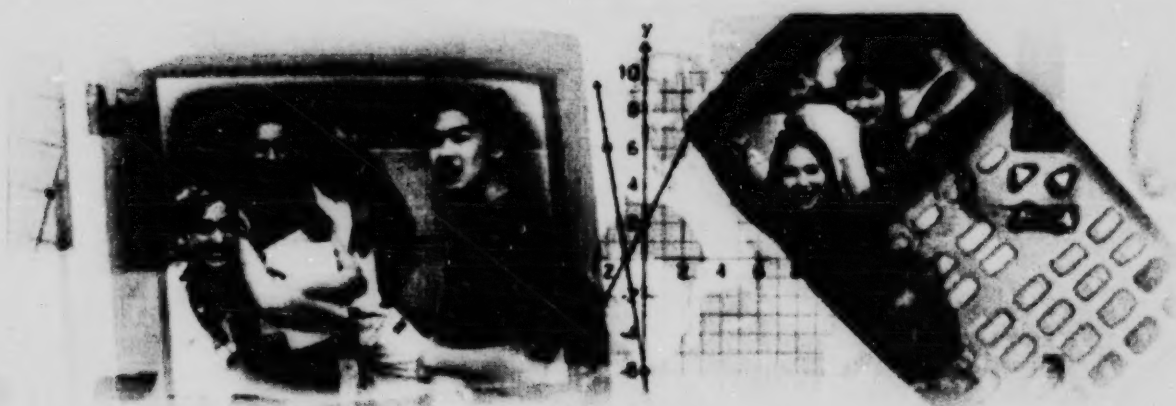
Starting in 2001-2002, successful completion of the test will be an Ontario Secondary School Diploma (OSSD) requirement. Students who do not successfully complete the reading and/or the writing portion(s) of the test will be required to retake the portion(s) of the test they did not complete successfully. School boards are responsible for ensuring that appropriate remediation programs and supports are in place.

Current Status

A trial administration of the OSSLT took place in October 2000. Results from this administration were released in March 2001.

An administration of the test was planned for October 2001. However, due to a breach of test security, the administration had to be postponed until later in the school year.

Information about all aspects of the OSSLT, including support materials for reading and writing as well as sample student answers from the October 2000 trial administration, is available on the EQAO Web site.



The Grade 9 Assessment of Mathematics, 2000–2001

The Grade 9 Assessment of Mathematics, administered for the first time in 2000–2001¹, measures how well students have met the expectations in *The Ontario Curriculum, Grades 9 and 10: Mathematics*. The assessment is based on the expectations for the entire Grade 9 curriculum for applied and academic mathematics courses.

Students in locally developed courses do not take part in this assessment. Locally developed courses are developed within school boards to meet educational needs that are not met by courses outlined in the provincial curriculum policy documents.² Information collected during the administration of the 2000–2001 Grade 9 assessment indicates that there were 8954 students enrolled in locally developed courses during the 2000–2001 school year.

Applied and Academic Courses

In Grades 9 and 10, students may choose between two types of courses: applied and academic. EQAO develops separate versions of the assessment for students in applied and academic courses. However, since some of the expectations for applied and academic courses overlap, approximately 40% of the items are common to both the applied and academic versions.

¹ In 1997–1998, EQAO assessed a sample of Grade 9 students in mathematics. However, that assessment was based on the previous curriculum and consequently the results EQAO reported from that assessment cannot be compared with the results from this year's assessment.

² In cases where students' educational and/or career preparation needs cannot be met by the provincial curriculum policy documents, school boards may develop courses locally that can be counted for credits for diploma purposes. The Ministry of Education's policy regarding locally developed courses is set out in *Ontario Secondary Schools, Grades 9 to 12: Program and Diploma Requirements, 1999 (OSS)*, section 7.1.2. With certain exceptions, all locally developed courses must be approved by the Ministry. See *Guide to Locally Developed Courses, Grades 9 to 12: Approval Requirements and Procedures*.

FAST FACTS:

APPLIED

Number of
Students: 42 000

ACADEMIC

Number of
Students: 96 000

Development of the Assessment

The assessment was developed to serve the following purposes:

- to provide valid and reliable information about student achievement;
- to provide a broad window on students' knowledge and skills in mathematics; and
- to contribute to student learning.

EQAO worked with assessment experts to establish the framework for the assessment.

Teams of classroom teachers from across the province were involved in developing items for the assessment and, as part of the development process, were able to try out items in their classes.

The year before the assessment was administered, all of the items were pilot-tested in mathematics classes drawn from a cross-section of schools across the province. In May 2000, several different forms of the assessment were field-tested in a sample of applied and academic classes. Additional items were pilot-tested and field-tested during the January 2001 administration. At various stages, students and teachers provided feedback on the assessment items. EQAO used this feedback to revise and finalize the assessment and assessment materials for the administrations in January and June 2001.

Finally, the assessment was validated by educators with expertise in mathematics, in-depth knowledge of the expectations for Grade 9 (as outlined in *The Ontario Curriculum, Grades 9-10: Mathematics*), experience with equity issues, knowledge of students with special needs and technical expertise in the areas of assessment validity and reliability

Contents of the Assessment

The assessment included a multiple-choice component, a short answer component and performance-based tasks that required written responses (an answer, an explanation, a graph, etc.).

Multiple-Choice

Students were asked to complete 24 questions during a 30-minute period. Each multiple-choice question was related to a single strand and category (see strand and category descriptions below). The multiple-choice component allowed students to demonstrate their understanding of mathematics concepts without having to show their work or write responses.

Short Answer

Students were asked to complete 10 items during a 30-minute period. Each short answer item was related to a single strand and category. These items required students to think mathematically but required minimal written response.

Tasks

Students were asked to complete a total of six tasks. Each task was a collection of related questions based on one or two strands from the curriculum. Each task was scored for achievement across all four categories and strands related to the task.

Additional Component

Students completed an additional 30-minute component that was scored but did not count towards their results. This component included items that were used to establish comparability between the assessments administered in January and June. It also included items that were being pilot-tested or field-tested for future use.

Participation in the Assessments

All Grade 9 students who are enrolled in an applied or academic mathematics course are expected to participate in this annual assessment. An accommodation policy is in place to support students with special needs and students who require special provisions due to a lack of proficiency in English.

Principals and teachers are responsible for accommodating students with special needs identified in an Individual Education Plan (IEP) so that these students can take part in the assessment. The list of permitted accommodations appears in the *Guide for Principals and Teachers Administering the Grade 9 Assessment of Mathematics* (administration guide).

Principals and teachers are also able to make special provisions for students enrolled in English as a Second Language (ESL)/English Literacy Development (ELD) programs. The list of permitted special provisions appears in the administration guide.

The principal may consider exempting any student who, despite the permitted accommodations and special provisions, would not be able to provide evidence of learning.

Decisions about accommodations, special provisions and exemptions must be made by the principal on an individual basis and in consultation with the student, his or her parent(s)/guardian(s) and appropriate staff. Parental consent is required.

Administration of the Assessments

The assessment was administered January 11-23, 2001 to students in first-semester mathematics courses and May 28-June 14, 2001 to students in second-semester and full-year courses.

Principals had the option to administer the assessment over three or five days.

Three Days of Assessment

Day One:	
Multiple-Choice Questions	30 min
Tasks (1-3)	40 min
Day Two:	
Short Answer Items	30 min
Tasks (4-6)	40 min
Day Three:	
Additional Component (Multiple-Choice, Short Answer or Tasks)	30 min

Five Days of Assessment

Day One:	
Multiple-Choice Questions	30 min
Day Two:	
Tasks (1-3)	40 min
Day Three:	
Short Answer Items	30 min
Day Four:	
Tasks (4-6)	40 min
Day Five:	
Additional Component (Multiple-Choice, Short Answer or Tasks)	30 min

Marking the Assessment

Trained teacher markers scored the short answer and performance-based items using a scoring scale that had 3-5 possible scores for each item. The multiple-choice items were machine-scored and the multiple-choice scores were combined with the short answer and performance-based scores to produce category, strand and overall scores. With the aid of a statistical procedure that took into account the degree of difficulty of each test item and the input of teacher markers, the category, strand and overall scores were then mapped onto EQAO's reporting scale.

This scoring procedure allows for more precise scoring and the comparability of the category, strand and overall results from administration to administration and from year to year.

Reporting Results

Achievement Levels

EQAO reports on student achievement in Grade 9 mathematics using a four-level scale. This four-level scale, including the percentages assigned to each level, is aligned with the scale used in *The Ontario Curriculum, Grades 9 and 10: Mathematics* and the *Provincial Report Card, Grades 9-12*. The achievement chart setting out the percentages corresponding to each of the levels appears in Appendix A.

Overall Achievement

The overall achievement level provides a general picture of students' achievement of the curriculum expectations in mathematics. The overall level reflects achievement across all of the categories and strands.

Strand and Category Achievement

The strand and category achievement levels provide more detailed information about students' knowledge and skills in specific areas of the mathematics curriculum. The strands and categories are based on those in the *Ontario Curriculum*. The four strands provide information on students' strengths and weaknesses in the major content areas of mathematics (i.e., number sense and algebra, relationships, measurement and geometry, and analytic geometry). The four categories (i.e., knowledge and understanding, problem solving, application, and communication) provide information on strengths and weaknesses in specific knowledge and skill areas that apply across all four strands.

Technical information on all aspects of the Grade 9 assessment, including the scoring procedures and the method used to calculate students' overall level of achievement, will be available on the EQAO Web site (www.eqao.com) in December 2001.

Provincial Standard

The Ontario Curriculum establishes Level 3 as the provincial standard. As stated in the curriculum, this is a high level of achievement and students who are achieving this level or above can be confident that they are "well prepared for work in the next grade or the next course."

The Ontario Curriculum identifies Level 1 as a "passable level of achievement."

Below Level 1

Below Level 1 identifies insufficient achievement of the curriculum expectations.

Insufficient Information to Score

This designation represents student work that could not be scored because large sections were missing or illegible.

Exempt or No Data

These designations include students who were formally exempted from participation in one or more components of the assessment and non-exempt students from whom EQAO did not receive completed assessment booklets.

Questionnaire Data

During both the January 2001 and June 2001 administrations, teachers and students of both applied and academic courses were asked to complete detailed questionnaires. Their responses were tabulated anonymously. Except in cases where a student's or teacher's privacy would be compromised, EQAO tabulates student questionnaire data for the province as a whole and by school and school board, and it tabulates teacher questionnaire data for the province as a whole and by school board. The provincial questionnaire data in this report, together with the wide range of contextual data that schools and school boards collect locally, should be referred to when interpreting the achievement results.

Sample Test Items and Student Work

The following are sample multiple-choice questions, short answer questions and performance tasks from the 2000–2001 Grade 9 Assessment of Mathematics. Some of these sample items were on either the applied or the academic version of the assessment; others were common to both versions.

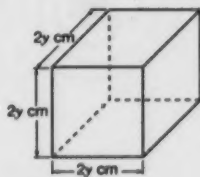
The student responses show the correct answer or a response that would have received a high score.

Complete sets of the sample items that were released from the 2000–2001 assessment are available on EQAO's Web site at www.eqao.com.

Multiple-Choice Items

Common Items

1. Each side of a cube is $2y$ cm long. What is the volume of the cube?



- (A) $8y^3 \text{ cm}^3$
(B) $6y \text{ cm}^3$
(C) $4y^3 \text{ cm}^3$
(D) $2y \text{ cm}^3$

3. The cost, C , in dollars to print leaflets, n , is given by the formula
 $C = 35 + 0.03n$.

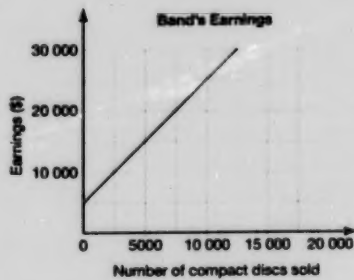


What is the cost of printing 900 leaflets?

- (A) \$27.00
(B) \$35.00
(C) \$37.70
(D) \$62.00

Applied Items

7. A recording company offers a band a \$5000 signing bonus plus \$2 for every CD sold as shown on the graph.

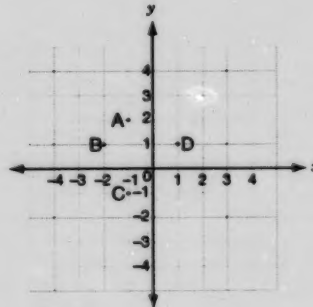


How many compact discs must the band sell in order to earn \$25 000?

- A 5000
- B 7500
- ☒ C 10 000
- D 15 000



9. Which points on the graph have the same y-coordinates?



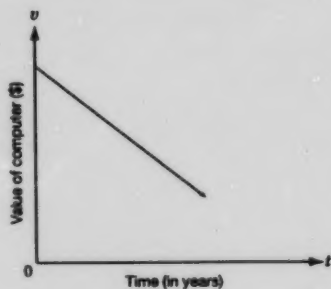
- A A and B
- B A and C
- C B and C
- ☒ D B and D

Academic Items

10. A computer is expected to decrease in value over time. The relationship between the value, v , of the computer in dollars after t years is written as the following equation:

$$v = -300t + 2100$$

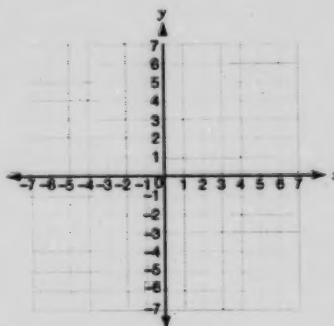
A line representing the relationship is graphed.



What does the v -intercept of the line represent?

- F the decrease in value per year
- ☒ G the initial value of the computer
- H the number of years until the value is \$0
- J the number of years the computer will work

12. What are the coordinates of the point of intersection of the lines $y = -x + 1$ and $x = 3$?



- ☒ F (3, -2)
- G (3, 2)
- H (2, 3)
- J (-2, 3)



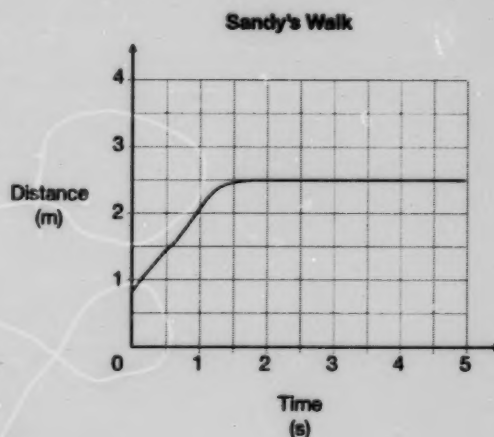
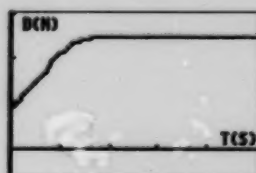
Short Answer Items

Common Items

1. Sandy walked away from a motion detector.



Below is a screen captured from the graphing calculator and a graph representing her walk.

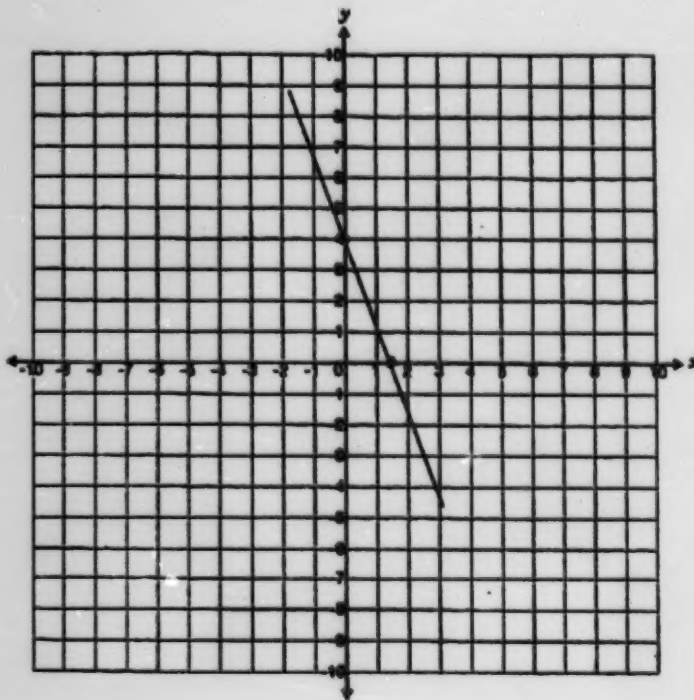


Describe Sandy's walk using mathematical language.
Use any of the information presented above.

Sandy began her walk at about 80 cm away from the motion detector. She walked at a constant rate until she was 2.5 m away from the motion detector, which was at time 1.5 seconds. She then remained standing still until 5 seconds were up.

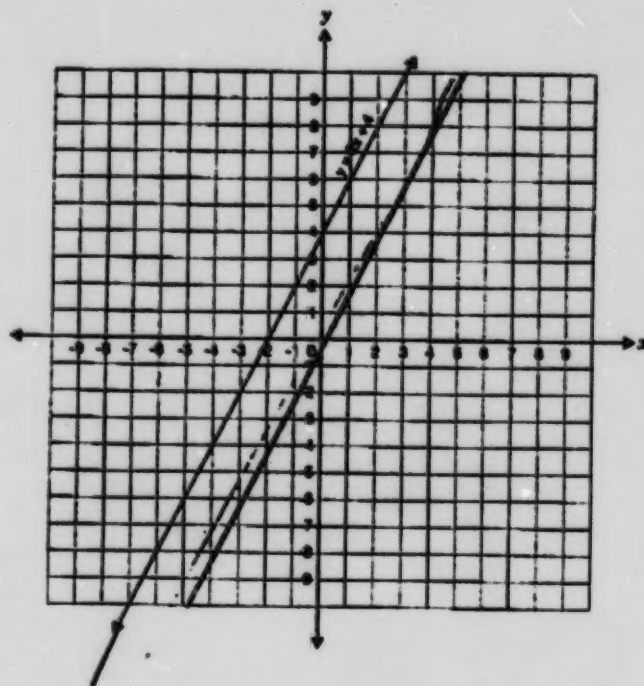
Common Items

2. Graph the line with a y-intercept of 4 and a slope of $\frac{1}{2}$.



Applied Items

4. Draw a line parallel to $y = 2x + 4$ and write its equation.

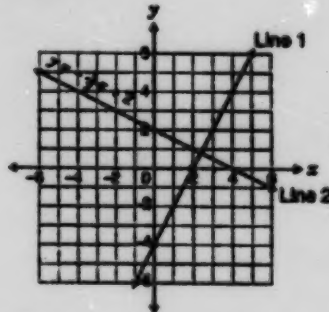


Academic Items

5. Two lines are shown on the graph below.

Line 1 passes through the points (0, -4) and (2, 0).

Line 2 has the equation $y = -\frac{1}{2}x + 2$.



$$\text{slope} = \frac{\text{rise}}{\text{run}}$$

$$= \frac{4}{2}$$

$$= 2$$

$$\text{slope} = \frac{\text{rise}}{\text{run}}$$

$$= \frac{2}{1}$$

$$= -2$$

Explain what is different about the slopes of the two lines.

They both have the same slope but Line 2 is negative and Line 1 is positive.



Tasks

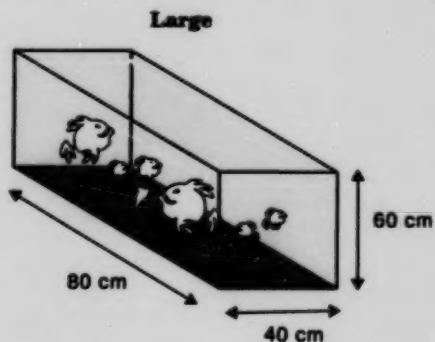
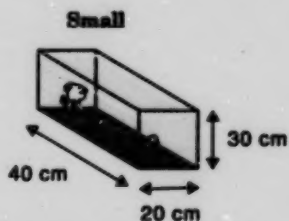
Common Task

Task 1: Aquarium



Aqua Aquariums sells aquariums in the shape of rectangular prisms. The aquariums are available in two sizes, small and large, with dimensions as shown. Each aquarium has glass sides and bottom, but no top.

NOTE: These aquariums are NOT drawn to scale.



- a) Calculate the volume of each aquarium.

Small

$$\begin{aligned}
 V &= lwh \\
 &= 40 \times 20 \times 30 \\
 &= 24\,000\text{cm}^3
 \end{aligned}$$

Large

$$\begin{aligned}
 V &= lwh \\
 &= 80 \times 40 \times 60 \\
 &= 192\,000\text{cm}^3
 \end{aligned}$$

- b) Calculate the total outside surface area of each aquarium.

NOTE: The aquariums have no tops.

Small	Large
$A_{total} = wh + 2h + 1w + 1h + 1h$ $= (20 \times 30) + (20 \times 30) + (40 \times 20) + (40 \times 30)$ $= 1200 + 1200 + 800 + 1200$ $= 4400 \text{ cm}^2$	$A_{total} = wh + wh + 1w + 1h + 1h$ $= (40 \times 60) + (40 \times 60) + (80 \times 40) + (80 \times 60)$ $= 4800 + 4800 + 3200 + 4800$ $= 17600 \text{ cm}^2$

- c) The cost of materials required to build the aquariums is \$0.002/cm² of surface area. Determine the cost of materials required to build each aquarium. Show your work.

Small	Large
$\begin{array}{r} 4400 \text{ cm}^2 \\ \times \$0.002 \\ \hline \$8.80 \end{array}$	$\begin{array}{r} 17600 \text{ cm}^2 \\ \times \$0.002 \\ \hline \$35.20 \end{array}$

- d) The cost of the materials required to build the large aquarium is 4 times the cost of the materials required to build the small aquarium.

$$35.20 \div 8.80 = 4$$

4

times

(check)

$$\begin{array}{r} 8.80 \\ \times 4.00 \\ \hline 35.20 \end{array}$$

- e) The selling price of the small aquarium is \$24. The selling price of the large aquarium is \$115.

Do the selling prices of the aquariums seem appropriate according to your calculations? Give reasons for your answer.

I don't think the selling prices are appropriate because according to my calculations the small aquarium is only \$8.50, and they're selling it for \$24.00. I think that's too much to sell the aquarium for, it's 3 times as much as it costs to build it. And the large aquarium is only \$35.70, but it's selling for \$115.00. This is also too much, it's about 3 times as more of the cost to build it.

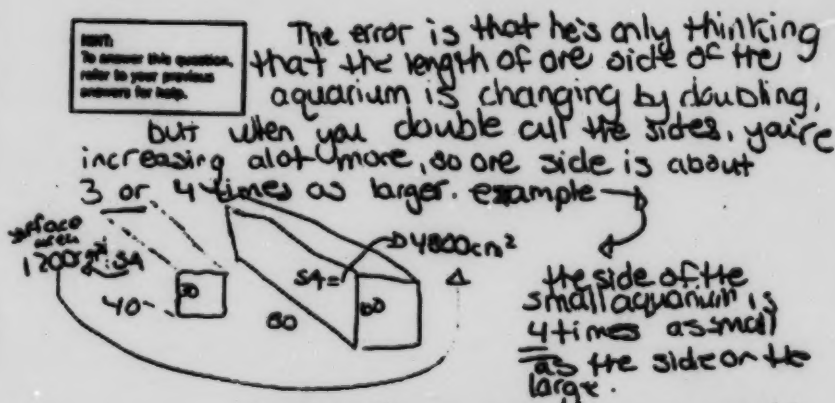
- f) Mohammed went into the store to buy an aquarium. After comparing the small and large aquariums, he tells the owner, "The large aquarium should only cost two times as much as the small aquarium."

He gives the following reasons:

- The dimensions of the large aquarium are two times bigger than those of the small aquarium.
- It takes two times more material to build the larger aquarium.

Explain the mathematical error in Mohammed's reasons.

NOTE:
To answer this question,
refer to your previous
answers for help.



∴ Each side on the large aquarium would be 4 times as large than the small, so the large needs 4 times as much material not only 2.

Applied Task

Task 2: Working for a Photographer

Sabine works for her mother who is a photographer. Each day she works she is paid a flat rate of \$10.00, plus an additional amount for each roll of film she develops.

The total amount she is paid for a day is represented by A .
The number of rolls of film she develops is represented by r .

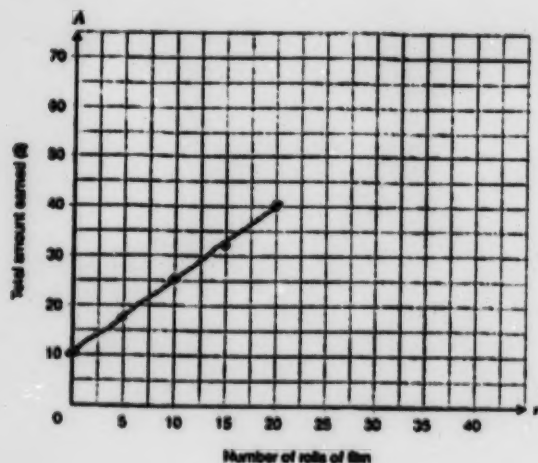


Number of rolls of film, r	Total amount paid, A (in dollars)	First differences
5	17.50	
10	25.00	7.50
15	32.50	7.50
20	40.00	7.50

- a) Calculate the first differences in the table. Explain what these first differences tell you about the way Sabine is paid.

For every 5 rolls she develops she gets \$7.50

b) Graph the relationship below.



- c) One day Sabine earns \$37.00.
How many rolls of film does she develop that day?
Give reasons for your answer.

1.5 per roll

≈ 18 rolls $\therefore$ Because she gets paid 32.50 for 18 and each roll cost 1.50 so $18 \times 1.50 = 27$ and $37 - 32.5 = 4.50$

- d) Describe how the graph in question b) would change if Sabine were paid only for the rolls of film she developed. She would receive no flat rate.

It would start at 0 and she wouldn't get paid as much.

- e) Her mother suggests that Sabine be paid a flat rate of \$50.00 for each day's work. She will earn the same amount no matter how many rolls she develops.

Should Sabine accept this offer? Give reasons for your answer.

Yes because she might not
develop anything and
she still gets paid
and its better then
she regularly makes



Academic Task

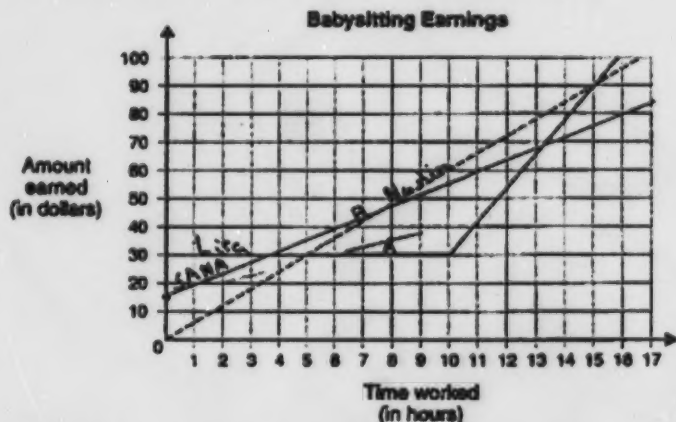
Task 2: Babysitters' Club

Nadia and Lisa are comparing their weekly earnings from babysitting. The following graph shows their earnings compared to the number of hours they worked in the week.

a) Lisa says:

"If we both work less than 5 hours or more than 15 hours, I earn more than you do."

Label Lisa's line with her name. Write Nadia's name on the other line.



b) Describe what the graph shows about how each girl is paid for her week of work. Include specific mathematical details about hourly rates of pay.

Lisa charges 30 dollars for the first up to ten hours and then charges 12 dollars an hour. Nadia charges 12 dollars an hour from the start.



- c) Sana also offers babysitting in the home. She lives on the edge of town and travels by bus to the home where she babysits.



Sana charges a family a set fee of \$15.00 per week to cover her bus pass plus an additional \$4.00 per hour.

Draw the graph for Sana's earnings on the graph in question a). Label your line.

- d) Your neighbour needs a babysitter for 12 h this week. How much would each of the three girls charge for this 12 h of babysitting? Show your work or explain how you get each answer.

$$\begin{aligned} \text{Lisa: } \$30 + 2 \times 12 &= \$54.00 \\ \text{Sana: } \$15 + 4 \times 12 &= \$63 \\ \text{Nadia: } \$7 \times 12 &= \$84 \end{aligned}$$

- e) Several neighbours have inquired about babysitters. Some require a lot of hours of babysitting per week while others require very few hours. They have asked you which of the babysitters charges the least. What would your answer be? Explain your reasoning. Be specific about the time intervals.

I would recommend Nadia for up to five hours, Lisa for 5-13.5 hours and Sana for 13.5 up because judging by the graph that is when they are cheapest.

2000-2001: Overall Achievement at a Glance¹

Overall Achievement in Grade 9 Mathematics — Applied

	Exempt	No Data	Insufficient Information to Score	Below Level 1	Level 1	Level 2	Level 3	Level 4
				Insufficient achievement of curriculum expectations.	A passable level of achievement. Achievement is <i>below</i> the provincial standard.	A moderate level of achievement. Achievement is <i>below but approaching</i> the provincial standard.	A high level of achievement. Achievement is <i>at</i> the provincial standard.	A very high to outstanding level of achievement. Achievement is <i>above</i> the provincial standard.
Method 1	3	6	15	16	24	25	13	< 1
Method 2	n/a	n/a	16	17	26	27	14	< 1

Overall Achievement in Grade 9 Mathematics — Academic

	Exempt	No Data	Insufficient Information to Score	Below Level 1	Level 1	Level 2	Level 3	Level 4
				Insufficient achievement of curriculum expectations.	A passable level of achievement. Achievement is <i>below</i> the provincial standard.	A moderate level of achievement. Achievement is <i>below but approaching</i> the provincial standard.	A high level of achievement. Achievement is <i>at</i> the provincial standard.	A very high to outstanding level of achievement. Achievement is <i>above</i> the provincial standard.
Method 1	1	1	3	6	14	26	44	5
Method 2	n/a	n/a	3	7	14	26	44	6

☐ Method 1

In Method 1 all data are reported. Method 1 expresses the number of students achieving each level as a percentage of all of the students in academic or applied courses and includes students who scored below Level 1, those who produced insufficient information to score, those who produced no data and those who were exempt.

Method 1 is EQAO's primary method of reporting because publicly funded schools are accountable for the achievement and progress of all students. Schools and school boards are required to use this method to ensure consistency of reporting across the province.

Due to rounding, percentages may not always total 100.

Overall levels as well as category and strand levels are adjusted for differences in assessments from administration to administration and from year to year.

☐ Method 2

Method 2 is an alternative way of presenting the data. Method 2 expresses student results as a percentage of those students who actually took part in the assessment and produced some work. Students who were exempt, or for whom there were no performance data, are excluded.

Method 2 highlights the results achieved by students who have at least some scorable work.

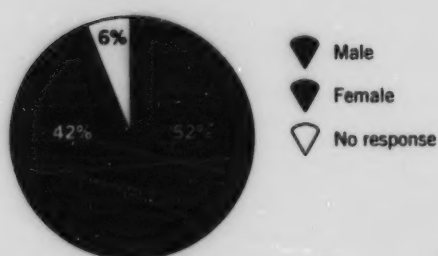
¹ The achievement chart setting out the percentages corresponding to each of the levels appears in Appendix A.

Profile of Students Who Wrote the Assessment – Applied

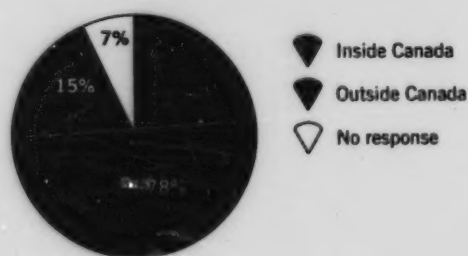
Number of Students

First semester	Second semester	Full year	Total number of students*
18 257	16 735	6 367	41 708

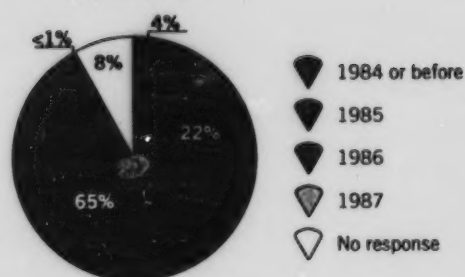
Gender



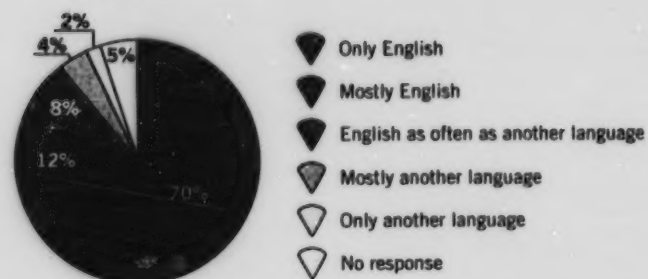
Place of birth



Year of birth



Language(s) spoken at home



"Applied courses focus on the essential concepts of a subject, and develop students' knowledge and skills through practical applications and concrete examples. Familiar situations are used to illustrate ideas, and students are given more opportunities to experience hands-on applications of the concepts and theories they study."

The Ontario Curriculum, Grades 9 to 12: Program Planning and Assessment, 2000

* Some students did not indicate whether they were enrolled in a semestered or full-year course. As a result, there are some students included in the total who are not counted as part of the first semester, second semester or full-year statistics.

2000-2001: Overall Achievement – Applied¹

	<i>Exempt</i>	<i>No Data</i>	<i>Insufficient Information to Score</i>	<i>Below Level 1</i>	<i>Level 1</i>	<i>Level 2</i>	<i>Level 3</i>	<i>Level 4</i>
				Insufficient achievement of curriculum expectations.	A passable level of achievement. Achievement is <i>below</i> the provincial standard.	A moderate level of achievement. Achievement is <i>below but approaching</i> the provincial standard.	A high level of achievement. Achievement is <i>at</i> the provincial standard.	A very high to outstanding level of achievement. Achievement is <i>above</i> the provincial standard.
Method 1	3	6	15	16	24	25	13	< 1
Method 2	n/a	n/a	16	17	26	27	14	< 1

Method 1

In Method 1 all data are reported. Method 1 expresses the number of students achieving each level as a percentage of all of the students in applied courses, including students who scored below Level 1, those who produced insufficient information to score, those who produced no data and those who were exempt.

Method 1 is EQAO's primary method of reporting because publicly funded schools are accountable for the achievement and progress of all students. Schools and school boards are required to use this method to ensure consistency of reporting across the province.

Due to rounding, percentages may not always total 100.

Overall levels as well as category and strand levels are adjusted for differences in assessments from administration to administration and from year to year.

Method 2

Method 2 is an alternative way of presenting the data. Method 2 expresses of student results as a percentage of those students who actually took part in the assessment and produced some work. Students who were exempt, or for whom there were no performance data, are excluded.

Method 2 highlights the results achieved by students who have at least some scorable work.

¹ The achievement chart setting out the percentages corresponding to each of the levels appears in Appendix A.

Overall Achievement in Grade 9 Mathematics — Applied, Semester 1

	Exempt	No Data	Insufficient Information to Score	Below Level 1	Level 1	Level 2	Level 3	Level 4
				Insufficient achievement of curriculum expectations.	A passable level of achievement. Achievement is <i>below</i> the provincial standard.	A moderate level of achievement. Achievement is <i>below but approaching</i> the provincial standard.	A high level of achievement. Achievement is <i>at</i> the provincial standard.	A very high to outstanding level of achievement. Achievement is <i>above</i> the provincial standard.
Method 1	3	5	17	16	25	23	11	< 1
Method 2	n/a	n/a	19	17	27	25	12	< 1

Overall Achievement in Grade 9 Mathematics — Applied, Semester 2

	Exempt	No Data	Insufficient Information to Score	Below Level 1	Level 1	Level 2	Level 3	Level 4
				Insufficient achievement of curriculum expectations.	A passable level of achievement. Achievement is <i>below</i> the provincial standard.	A moderate level of achievement. Achievement is <i>below but approaching</i> the provincial standard.	A high level of achievement. Achievement is <i>at</i> the provincial standard.	A very high to outstanding level of achievement. Achievement is <i>above</i> the provincial standard.
Method 1	2	7	13	15	23	26	14	< 1
Method 2	n/a	n/a	15	16	25	29	15	< 1

Overall Achievement in Grade 9 Mathematics — Applied, Full Year

	Exempt	No Data	Insufficient Information to Score	Below Level 1	Level 1	Level 2	Level 3	Level 4
				Insufficient achievement of curriculum expectations.	A passable level of achievement. Achievement is <i>below</i> the provincial standard.	A moderate level of achievement. Achievement is <i>below but approaching</i> the provincial standard.	A high level of achievement. Achievement is <i>at</i> the provincial standard.	A very high to outstanding level of achievement. Achievement is <i>above</i> the provincial standard.
Method 1	4	3	14	17	23	25	14	< 1
Method 2	n/a	n/a	15	18	25	27	15	< 1

Exemptions, Accommodations and Special Provisions — Applied

	<i>Receiving Special Education Support</i>	<i>Not Receiving Special Education Support</i>
Percentage of students who were exempt	6	2
Percentage of students who received accommodations and special provisions	2	1
Percentage of students who received accommodations	59	7
Percentage of students who received special provisions	1	2
Percentage of students who received no accommodations or special provisions	32	83
Percentage of students for whom information is missing	—	6

Overall Achievement by Gender — Applied (Girls)

	Exempt	No Data	Insufficient Information to Score	Below Level 1	Level 1	Level 2	Level 3	Level 4
				Insufficient achievement of curriculum expectations.	A passable level of achievement. Achievement is below the provincial standard.	A moderate level of achievement. Achievement is below but approaching the provincial standard.	A high level of achievement. Achievement is at the provincial standard.	A very high to outstanding level of achievement. Achievement is above the provincial standard.
Method 1	2	6	13	16	25	25	12	< 1
Method 2	n/a	n/a	14	18	27	27	13	< 1

Overall Achievement by Gender — Applied (Boys)

	Exempt	No Data	Insufficient Information to Score	Below Level 1	Level 1	Level 2	Level 3	Level 4
				Insufficient achievement of curriculum expectations.	A passable level of achievement. Achievement is below the provincial standard.	A moderate level of achievement. Achievement is below but approaching the provincial standard.	A high level of achievement. Achievement is at the provincial standard.	A very high to outstanding level of achievement. Achievement is above the provincial standard.
Method 1	3	5	16	15	22	24	13	< 1
Method 2	n/a	n/a	18	16	24	27	15	< 1

Overall Achievement by Language — Applied (Non-ESL)

	Exempt	No Data	Insufficient Information to Score	Below Level 1	Level 1	Level 2	Level 3	Level 4
				Insufficient achievement of curriculum expectations.	A passable level of achievement. Achievement is below the provincial standard.	A moderate level of achievement. Achievement is below but approaching the provincial standard.	A high level of achievement. Achievement is at the provincial standard.	A very high to outstanding level of achievement. Achievement is above the provincial standard.
Method 1	2	5	15	16	24	25	13	< 1
Method 2	n/a	n/a	16	17	26	27	14	< 1

Overall Achievement by Language — Applied (ESL)

	Exempt	No Data	Insufficient Information to Score	Below Level 1	Level 1	Level 2	Level 3	Level 4
				Insufficient achievement of curriculum expectations.	A passable level of achievement. Achievement is below the provincial standard.	A moderate level of achievement. Achievement is below but approaching the provincial standard.	A high level of achievement. Achievement is at the provincial standard.	A very high to outstanding level of achievement. Achievement is above the provincial standard.
Method 1	23	4	20	20	16	11	5	< 1
Method 2	n/a	n/a	28	27	21	16	7	1

Overall Achievement by Special Education Support — Applied (Not Receiving Support)

	Exempt	No Data	Insufficient Information to Score	Below Level 1	Level 1	Level 2	Level 3	Level 4
				Insufficient achievement of curriculum expectations.	A passable level of achievement. Achievement is below the provincial standard.	A moderate level of achievement. Achievement is below but approaching the provincial standard.	A high level of achievement. Achievement is at the provincial standard.	A very high to outstanding level of achievement. Achievement is above the provincial standard.
Method 1	2	6	15	14	23	26	14	< 1
Method 2	n/a	n/a	16	16	25	28	15	< 1

Overall Achievement by Special Education Support — Applied (Receiving Support)

	Exempt	No Data	Insufficient Information to Score	Below Level 1	Level 1	Level 2	Level 3	Level 4
				Insufficient achievement of curriculum expectations.	A passable level of achievement. Achievement is below the provincial standard.	A moderate level of achievement. Achievement is below but approaching the provincial standard.	A high level of achievement. Achievement is at the provincial standard.	A very high to outstanding level of achievement. Achievement is above the provincial standard.
Method 1	6	4	15	21	24	21	9	< 1
Method 2	n/a	n/a	16	24	27	23	10	< 1

Achievement in Grade 9 Mathematics by Category — Applied

<i>Knowledge/Skills Categories</i>	<i>Exempt</i>	<i>No Data</i>	<i>II S*</i>	<i>NEI**</i>	<i>Level 1</i>	<i>Level 2</i>	<i>Level 3</i>	<i>Level 4</i>
Knowledge/Understanding - understanding of concepts - performing algorithms, operations and procedures								
Method 1	3	6	20	12	20	25	15	< 1
Method 2	N/A	N/A	22	13	22	27	16	< 1
Application - selecting concepts, formulas, algorithms, tools to fit the information given								
Method 1	3	6	21	24	18	19	9	1
Method 2	N/A	N/A	23	26	20	20	10	1
Thinking/Inquiry/Problem Solving - reasoning - applying the steps of an inquiry/problem-solving process								
Method 1	3	6	22	18	25	17	10	< 1
Method 2	N/A	N/A	24	19	27	19	11	< 1
Communication - explaining reasoning - using mathematical language, symbols, visuals and conventions								
Method 1	3	6	23	8	23	30	8	< 1
Method 2	N/A	N/A	25	8	25	33	9	< 1

*Category scores are not adjusted for year-to-year differences in assessments.

**IIS = Insufficient Information to Score

***NEI = Not Enough Evidence for Level 1

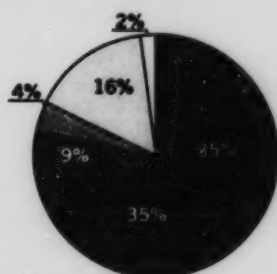
Achievement in Grade 9 Mathematics by Strand — Applied

Knowledge/Skills Strands	Exempt	No Data	IIS^{**}	NET^{***}	Level 1	Level 2	Level 3	Level 4
Number Sense and Algebra - applying essential numeric skills in solving new problems within a context (rather than in isolation) - applying algebraic concepts and skills (basic exponent rules, operations with first-degree polynomials and solving first-degree equations) necessary for the study and application of relations (e.g., consolidating numerical skills by using them in a variety of contexts)								
Method 1	3	6	21	16	17	23	14	< 1
Method 2	N/A	N/A	23	17	18	25	16	< 1
Relationships - identifying and understanding the properties of linear relations through the collection and interpretation of data from a variety of real-life situations and the creation of algebraic models for the data (e.g., determining relationships between two variables by collecting and analyzing data)								
Method 1	3	6	24	7	22	29	10	< 1
Method 2	N/A	N/A	26	7	24	31	11	< 1
Analytic Geometry - using various mathematical forms to demonstrate understanding of the geometry of the <i>xy</i> plane with a focus on linear relations and properties of slope (e.g., graphing a line and writing the equation of a line from given information)								
Method 1	3	6	23	11	20	22	14	< 1
Method 2	N/A	N/A	26	12	22	24	16	< 1
Measurement and Geometry - understanding and using formulas and applications of three-dimensional figures to explore the relationships between measurement and geometry (e.g., relationship between volume and surface area, varying of one dimension on a measure) - demonstrating an understanding of some properties of triangles and quadrilaterals (e.g., determining the optimal values of various measurements through investigations facilitated by the use of concrete materials, diagrams and calculators or computer software)								
Method 1	3	6	27	12	19	23	11	< 1
Method 2	N/A	N/A	29	14	20	25	12	< 1

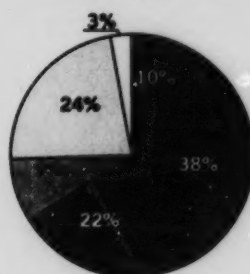
Findings from the Teacher and Student Questionnaires

Technology

Student access to computers during or after class

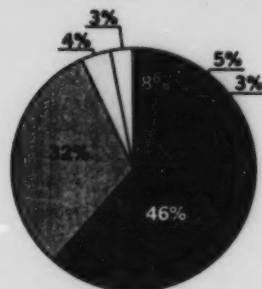


Student access to graphing calculators during or after class



- Never or hardly ever
- A few times during the course
- A few times a month
- A few times a week
- Daily
- No response

Availability of computers for mathematics instruction



- Computers for at least half the students
- Computers for less than half the students
- One computer in the classroom
- Computers available in the school but not in the classroom
- Computers difficult to access in the school
- No computers available
- No response

Availability of graphing calculators for mathematics instruction



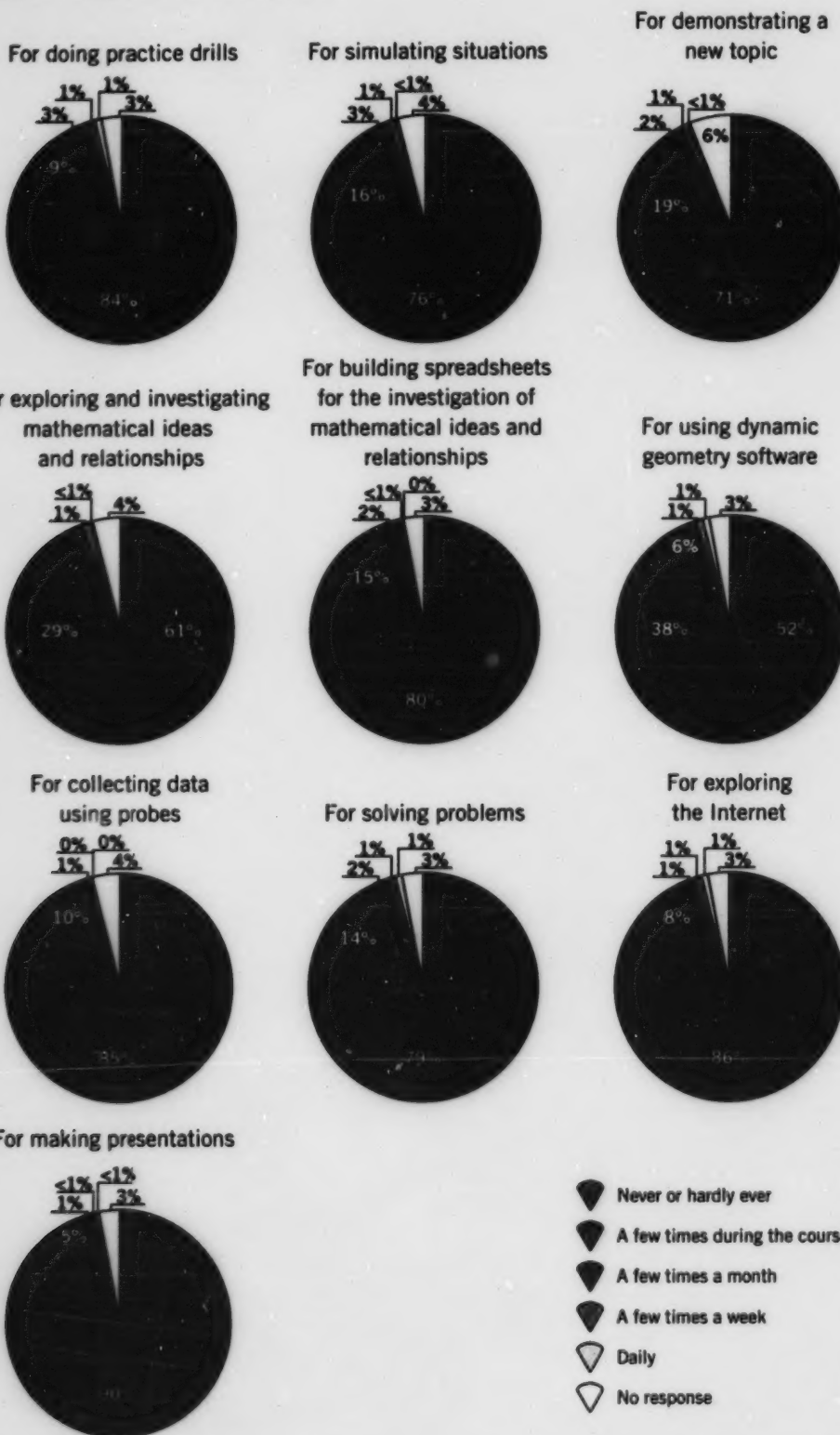
- Calculators for most students in the class
- Calculators available for half the students in the class
- A few calculators available
- Calculators can be booked easily for this class
- Not enough calculators available in the school
- No calculators in the school
- No response

"Technology helps to make students more powerful learners by giving them the means to explore mathematical concepts more easily and quickly. In the time gained by using technology, students can study fundamental ideas in greater depth, and can concentrate their effort in the areas of data collection, data analysis, simulations, and complex problem solving."

The Ontario Curriculum, Grades 9 and 10: Mathematics, 1999

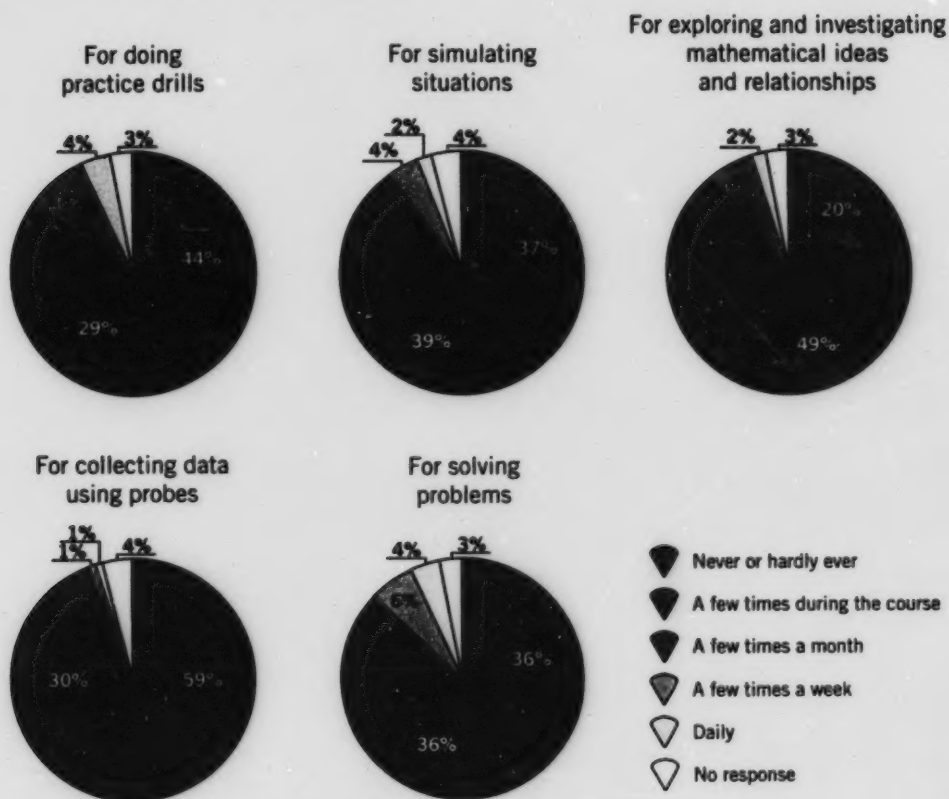
Technology (continued)

How often teachers use computers



Technology (continued)

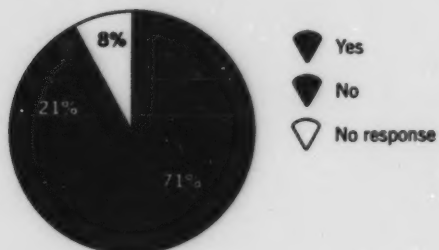
How often teachers use graphing calculators



Technology (continued)

Student use of technology at home

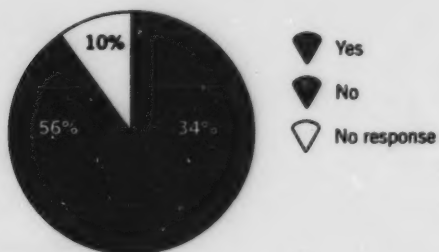
Students who have a computer at home for school work



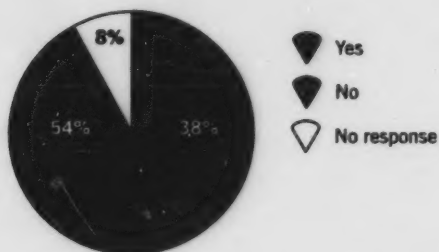
How often students use a home computer for mathematics homework



Students who have a scientific calculator at home for school work



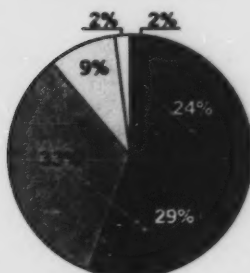
Students who have a graphing calculator at home for school work



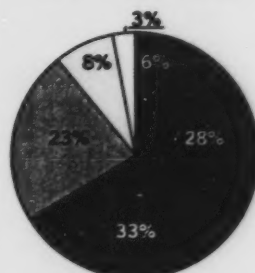
Teaching Strategies

How often teachers have students do the following:

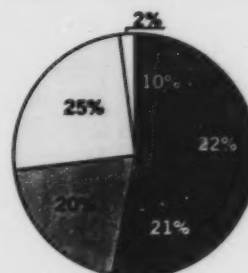
Apply mathematical concepts to authentic real-life contexts



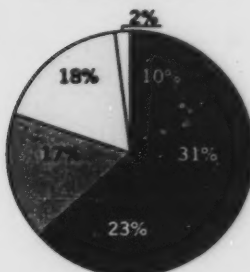
Use a variety of problem-solving strategies for finding answers



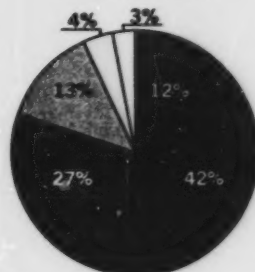
Use scientific calculators to do mathematics in problem-solving environments



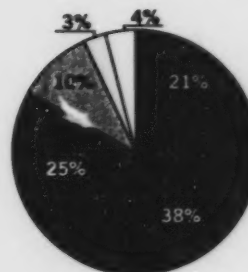
Use scientific calculators, when appropriate, to explore and learn mathematics and to explore patterns



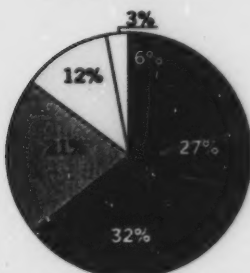
Use concrete materials to investigate and gain an understanding of new concepts



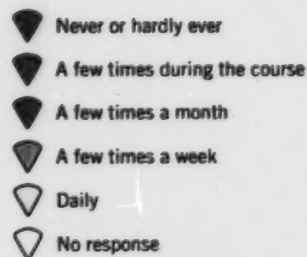
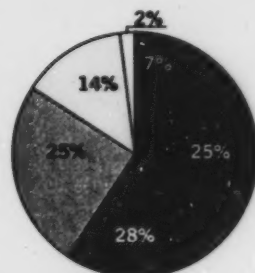
Solve open-ended problems



Work collaboratively to solve problems



Discuss problem-solving choices and strategies in class



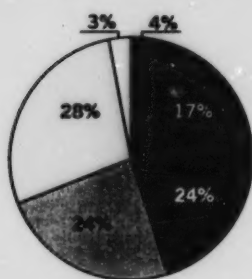
"Students in a mathematics class typically demonstrate diversity in the ways they best learn. It is important, therefore, that students have opportunities to learn in a variety of ways — individually, cooperatively, independently, with teacher direction, through hands-on experience, through examples followed by practice.

...Because there is no single, correct way to teach or to learn mathematics, the nature of this curriculum demands that a variety of strategies be used in the classroom. It is assumed that the strategies used will vary according to the object of the learning and the needs of the students."

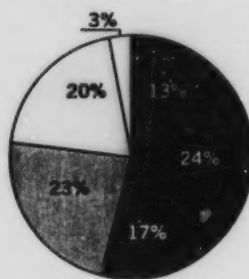
The Ontario Curriculum, Grades 9 and 10: Mathematics, 1999

Teaching Strategies (continued)

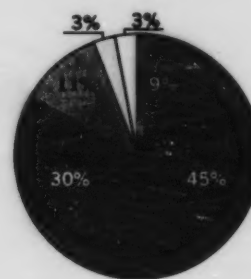
Discuss mathematical ideas and relationships



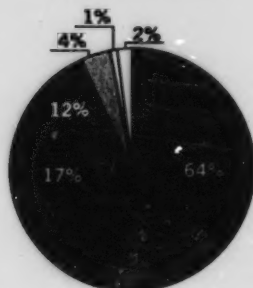
Practise mental mathematics



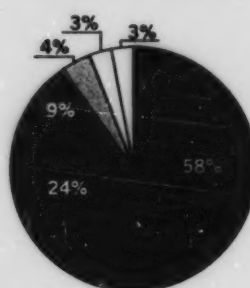
Conduct mathematical investigations



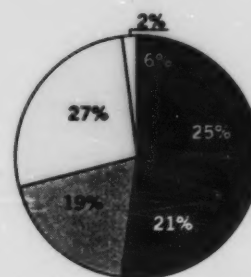
Engage in mathematics journal writing



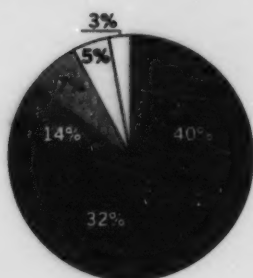
Have conferences with the teacher to demonstrate communication with appropriate mathematical language



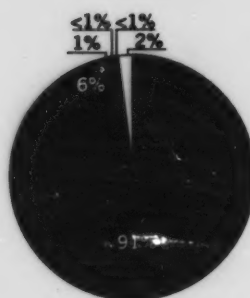
Write solutions in precise mathematical language



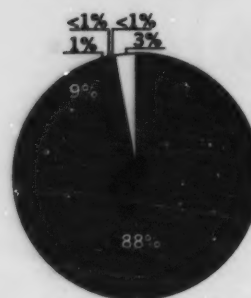
Demonstrate a mathematical process to other students



Watch mathematics videos



Use the Internet to find secondary data



- ◆ Never or hardly ever
- ◆ A few times during the course
- ◆ A few times a month
- ◆ A few times a week
- ◆ Daily
- ◆ No response

Teaching Strategies (continued)

Percentage of course time teachers spend on the following mathematics strands:

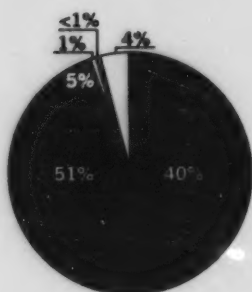
Number Sense
and Algebra



Relationships



Analytic Geometry

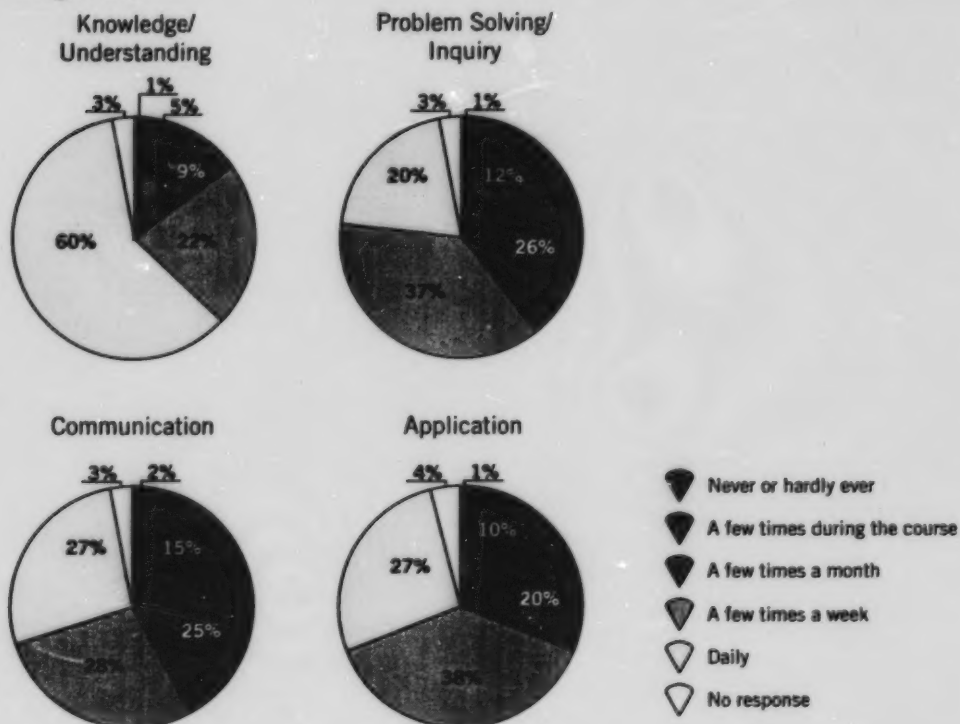


Measurement and
Geometry



Teaching Strategies (continued)

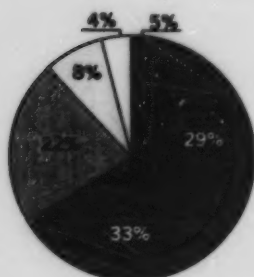
How often teachers have students do activities related to the following achievement categories:



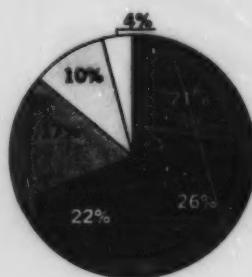
Classroom Assessment

How often teachers use the following materials and strategies in assessing students' progress in mathematics:

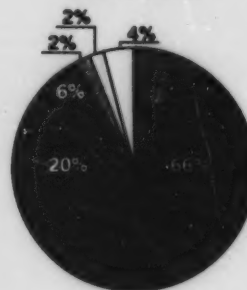
Mathematical concepts applied to authentic real-life contexts



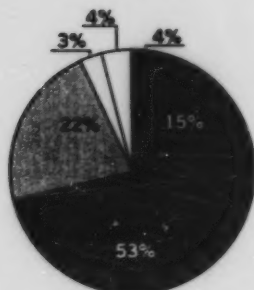
Observation notes and/or checklists



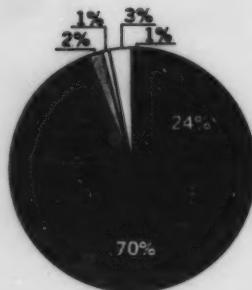
Conferences about mathematics



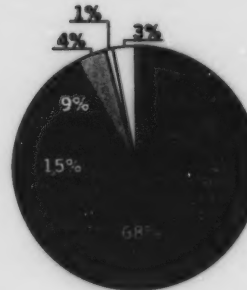
Small diagnostic paper-and-pencil tests



End-of-chapter tests



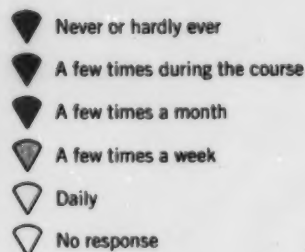
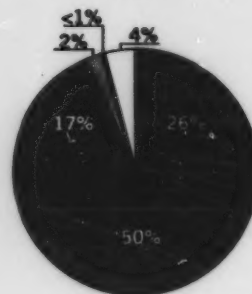
Mathematics journals



Demonstrations with materials



Investigations

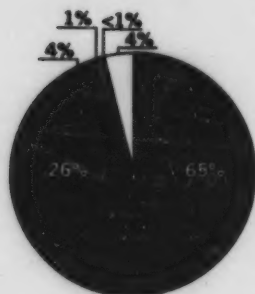


"Assessment and evaluation of student achievement provide teachers with an opportunity to think critically about their methods of instruction and the overall effectiveness of their program. Teachers and principals should systematically review course content, instructional strategies, and assessment procedures and make the program changes needed to improve their students' achievement."

The Ontario Curriculum, Grades 9 to 12: Program Planning and Assessment, 2000

Classroom Assessment (continued)

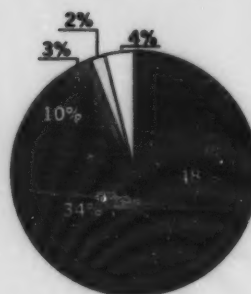
Results of work done on the computer



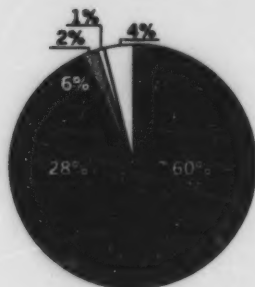
Demonstrations of mental mathematics ability and estimation



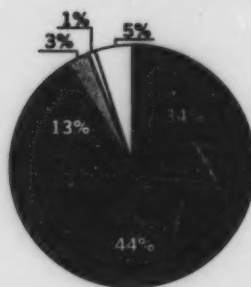
Self assessment



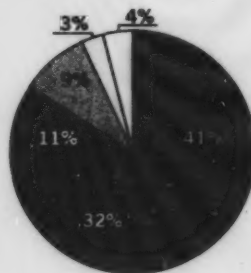
Peer assessment



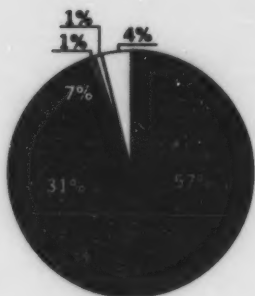
Solution of open-ended questions



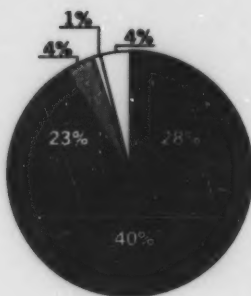
Student presentations of solutions to other students



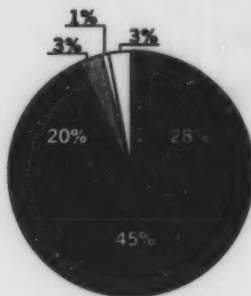
Constuction of physical/concrete materials



Rubrics related to the achievement charts



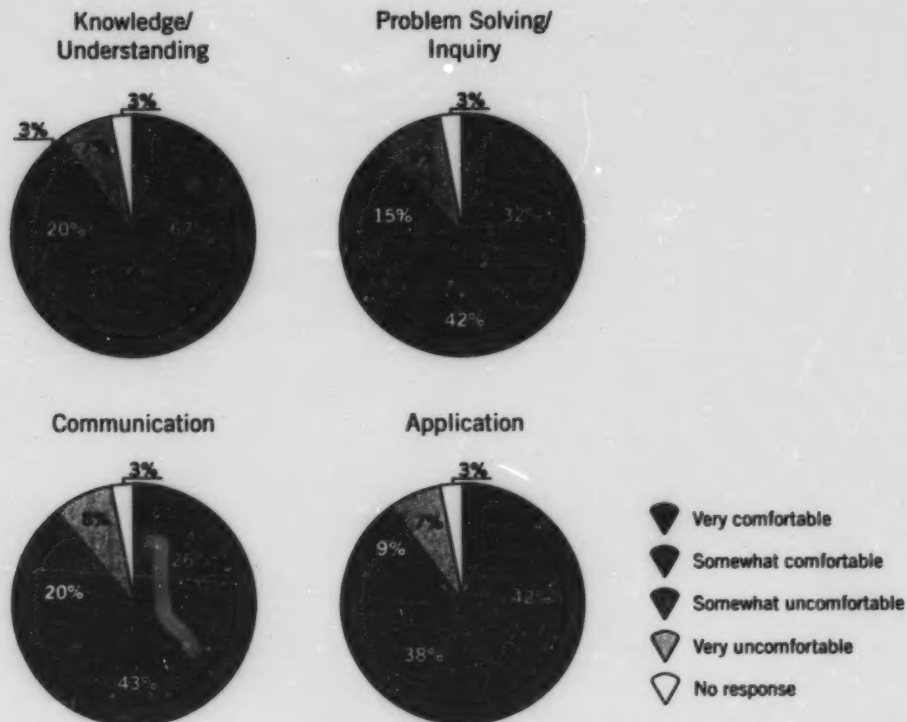
Results of work done on a graphing calculator



- ▼ Never or hardly ever
- ▼ A few times during the course
- ▼ A few times a month
- ▼ A few times a week
- ▼ Daily
- ▼ No response

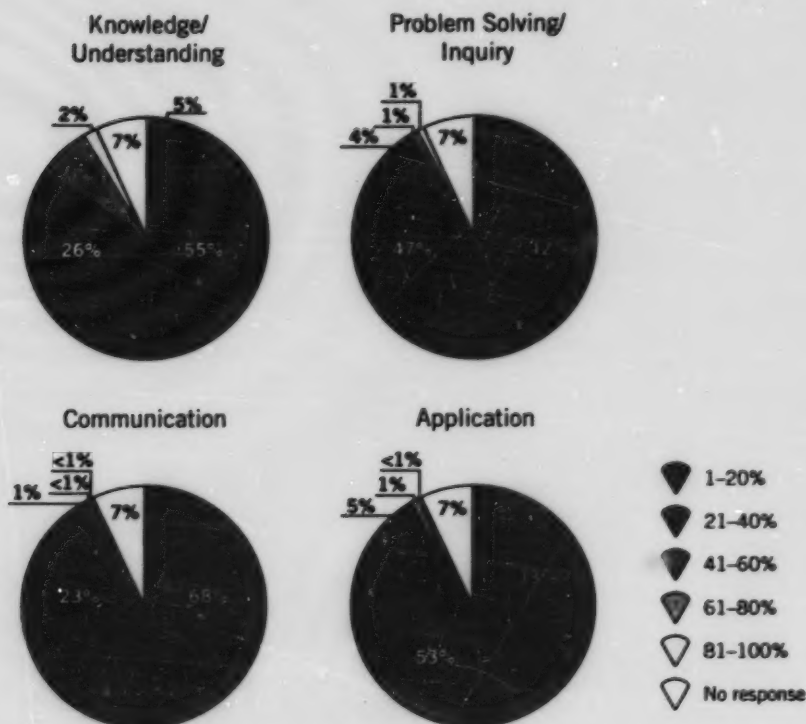
Classroom Assessment (continued)

How comfortable teachers are in assessing student achievement in the following achievement categories:

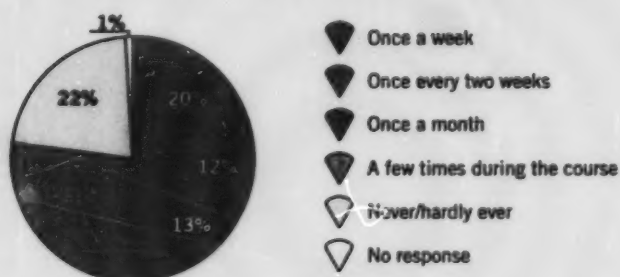


Classroom Assessment (continued)

Percentage of a students' final marks in mathematics that was based on each of the following achievement categories:

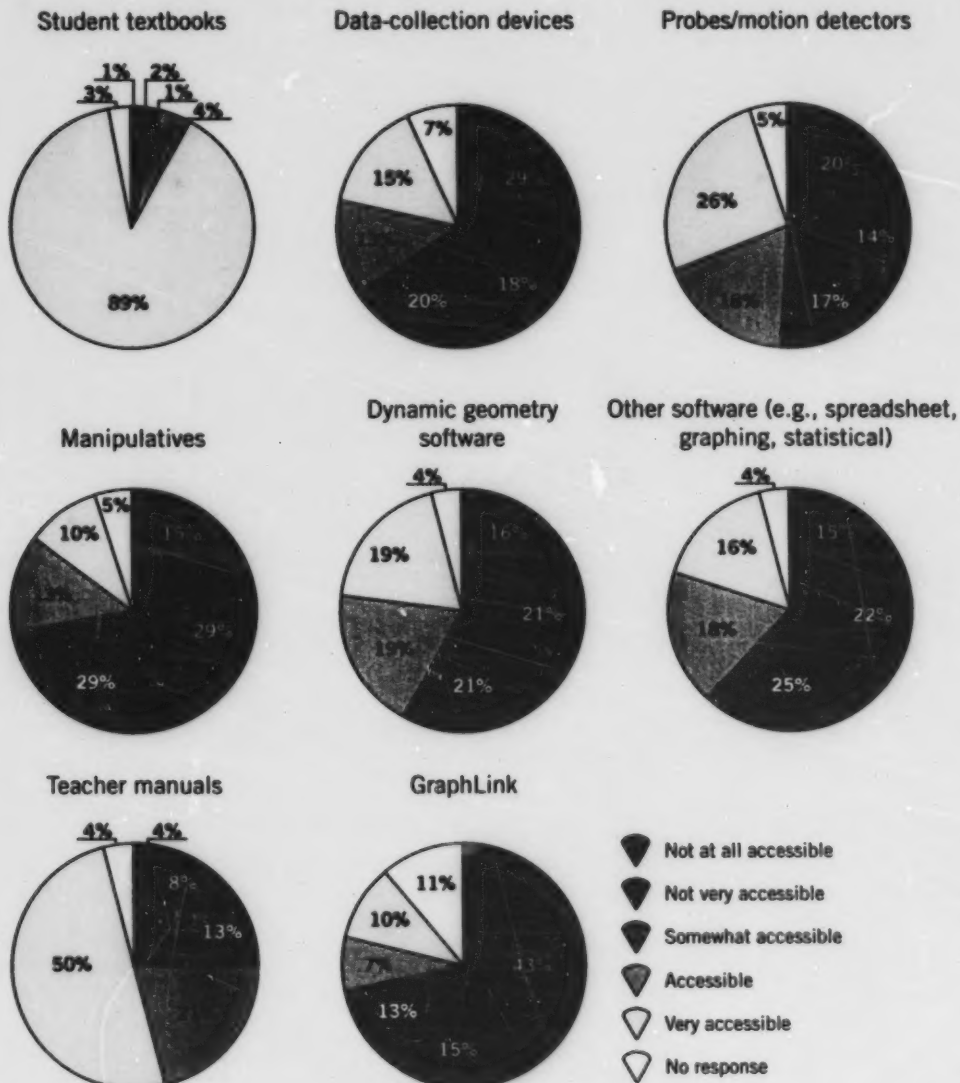


How often teachers meet with other mathematics teachers to plan or discuss curriculum and/or assessment



Availability of Instructional Materials and Learning Resources

Degree to which the following instructional materials are accessible to teachers and the students in their classrooms

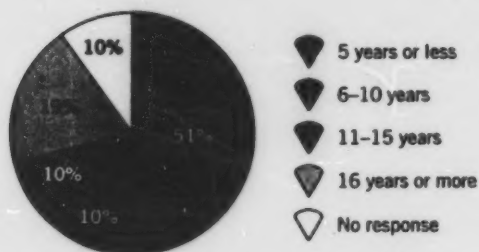


Teacher Population, Qualifications and Experience

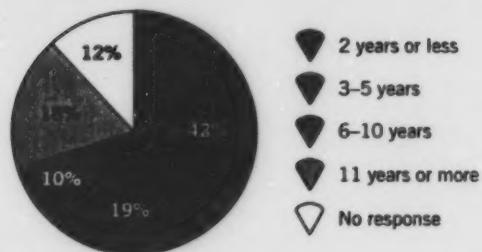
Gender



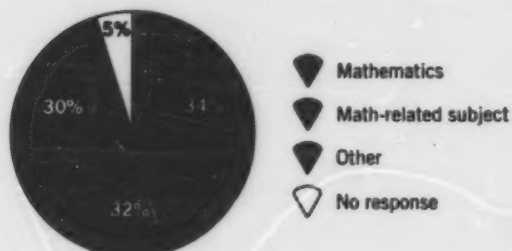
Number of years, including the current year, that teachers have been teaching mathematics at the secondary level



Number of years, including the current year, that teachers have been teaching Grade 9 mathematics



Teachers' major area of study while studying to obtain their bachelor's degree (or equivalent)



Teacher Population, Qualifications and Experience (continued)*Teachers who have completed or are presently working towards the following:*

Additional basic qualifications in mathematics	29%
Three-session qualifications in mathematics — intermediate and senior education	20%
Honours specialist qualification in mathematics	25%

Teachers who have extended personal knowledge of mathematics instruction through the following:

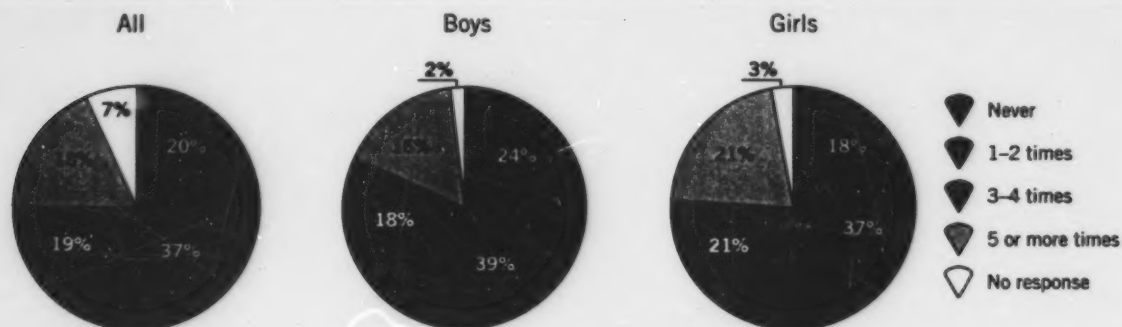
Participating in school-based workshops or seminars	70%
Participating in board-level workshops or seminars	65%
Participating in provincial-level conferences	25%
Writing curriculum materials at the school level	40%
Writing curriculum materials at the board level	9%
Writing curriculum materials at the provincial level	3%
Reading professional materials	78%
Visiting other classrooms	47%
Working with colleagues on projects related to curriculum and assessment	71%
Taking university or community college courses	19%
Marking large-scale assessments with EQAO	5%
Developing large-scale assessments with EQAO	3%
Searching the Internet for resources and techniques	64%
Attending summer institutes	25%
Consulting with colleagues on matters of curriculum and assessment	92%
Participating in class research projects	15%

Student Attendance and Homework

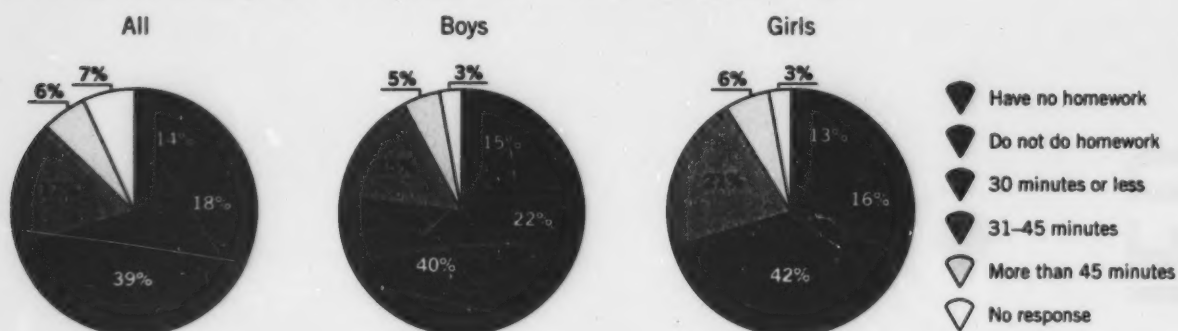
Students who have missed more than two weeks of school over the past year



Number of times students were absent from mathematics class during the previous month



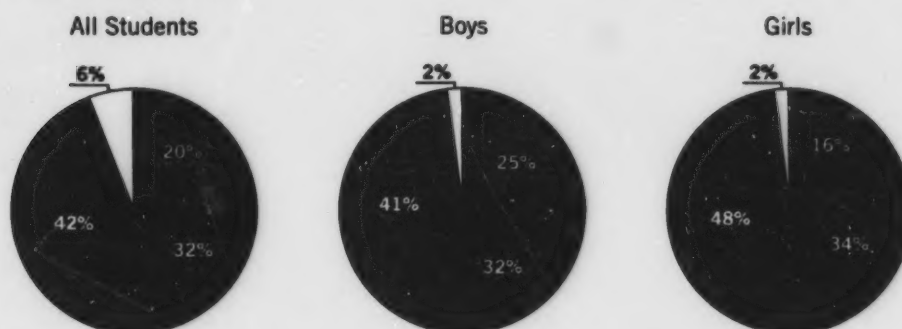
Time students usually spend on mathematics homework on any given day



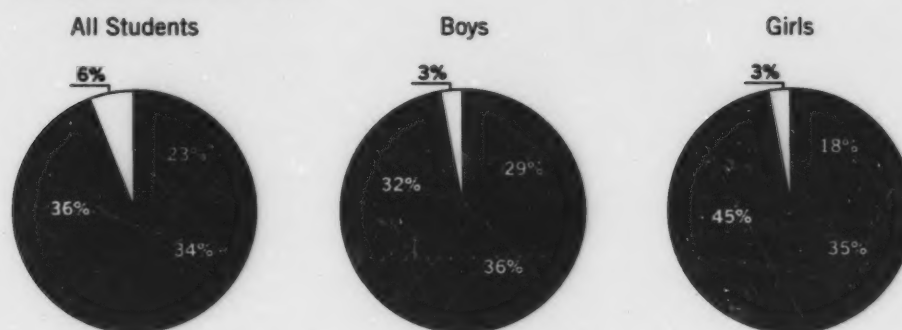
Student Attitudes towards Mathematics

Degree to which students agree or disagree with the following statements:

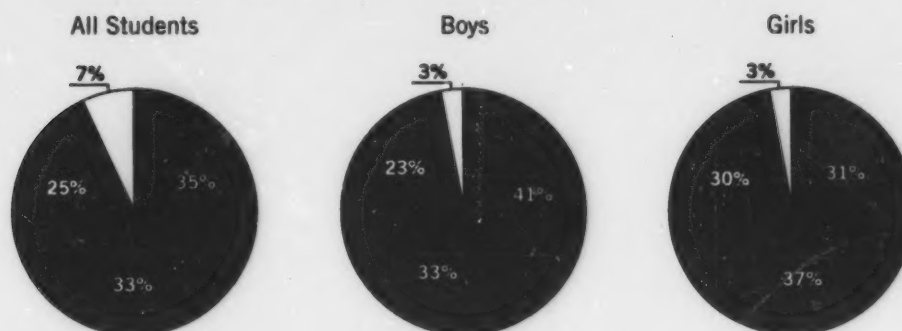
I like mathematics.



I am good at mathematics.

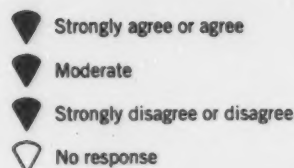


I understand most of the mathematics I am taught.



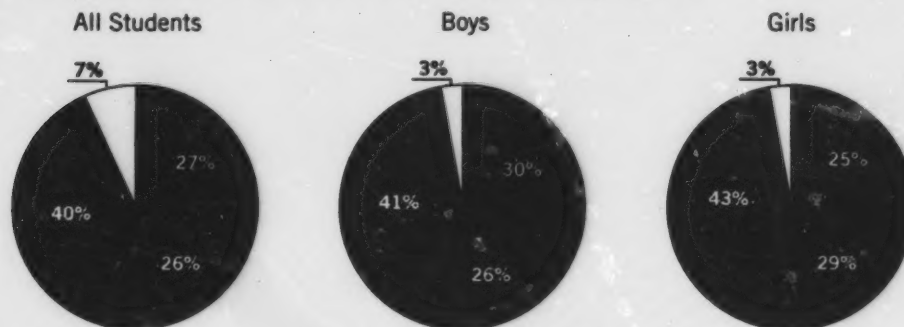
"Mathematics anxiety is a state of mind relating to a student's perception of his or her ability to do mathematics. It is neither grade specific nor exclusively gender related. If left unchecked, it often leads to mathematics avoidance."

The Ontario Curriculum, Grades 9 and 10: Mathematics, 1999

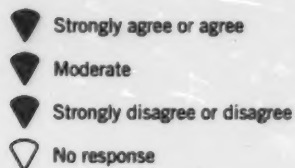
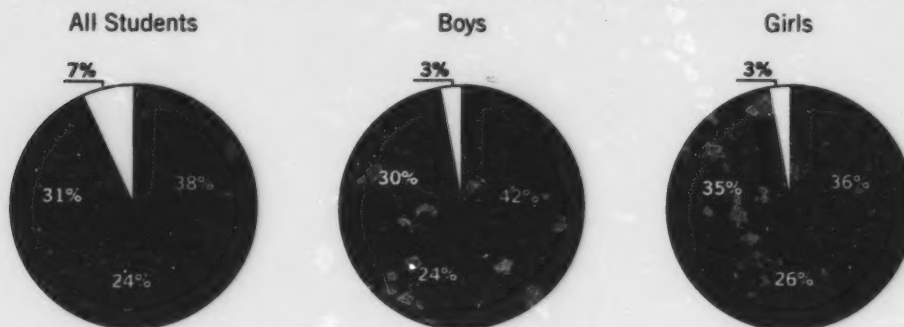


Student Attitudes towards Mathematics (continued)

The mathematics I learn now is very useful for everyday life.



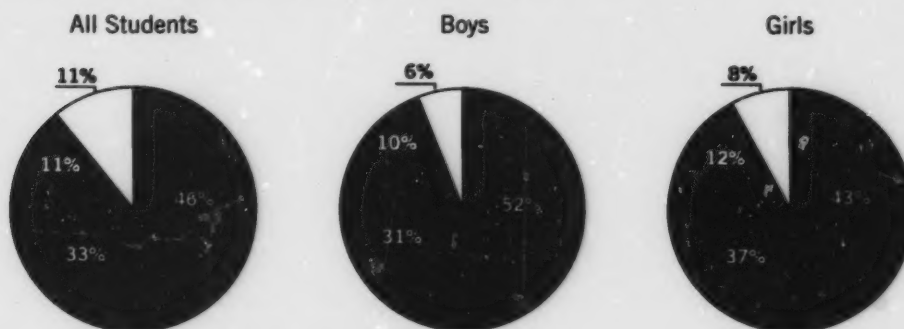
I need to keep taking mathematics for the kind of job I want after I leave school.



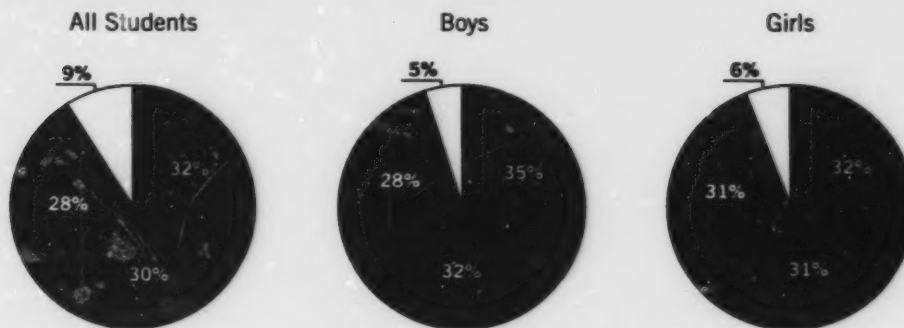
Student Attitudes towards Mathematics (continued)

How easy or hard students find the following:

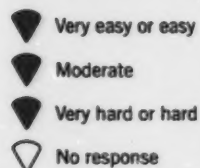
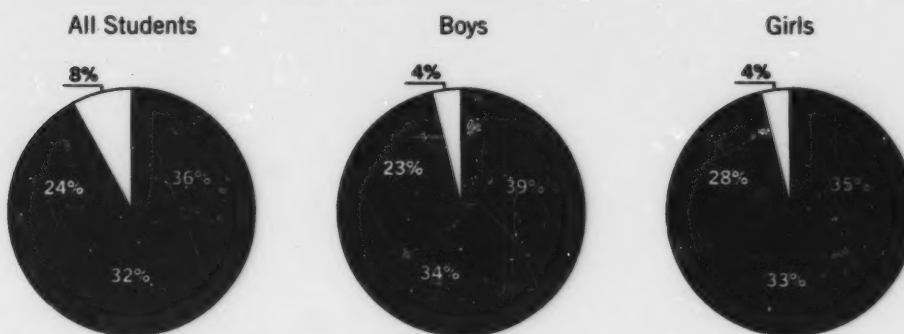
Mathematics questions that deal with number sense



Mathematics questions that deal with algebra

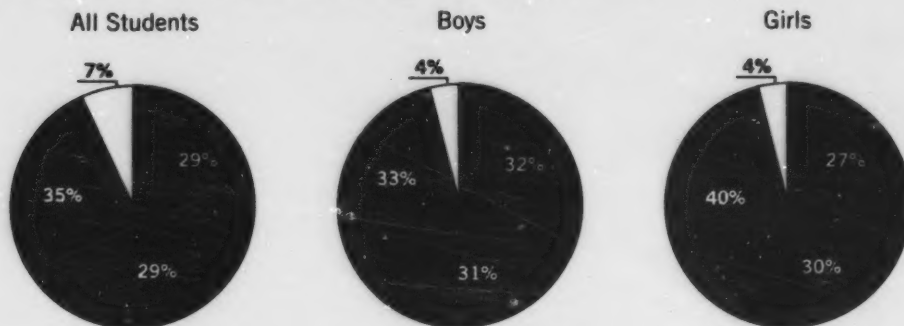


Mathematics questions that deal with relationships

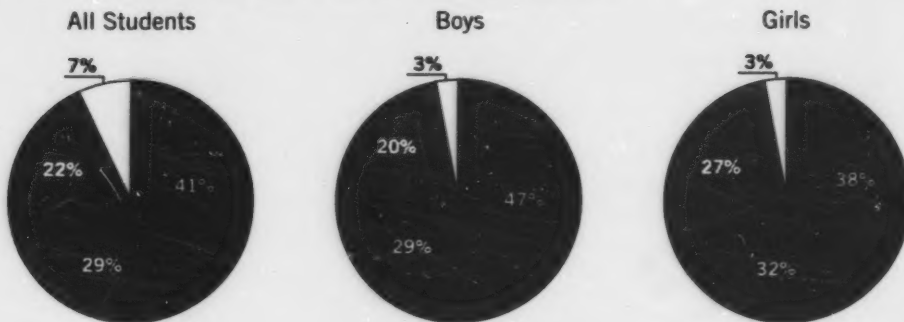


Student Attitudes towards Mathematics (continued)

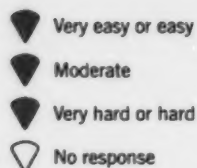
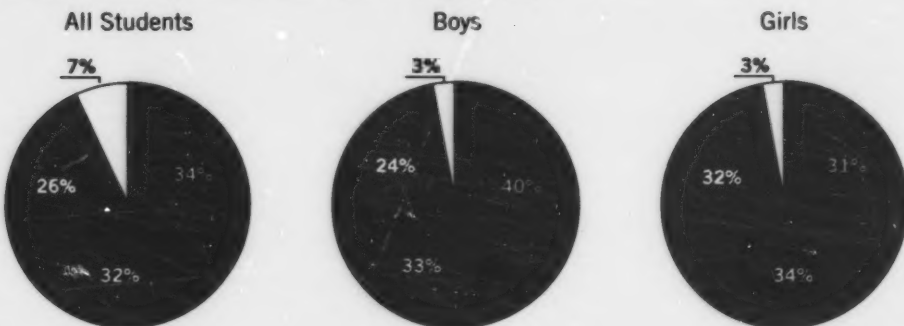
Mathematics questions that deal with analytic geometry



Mathematics questions that deal with measurement



Mathematics questions that deal with geometry

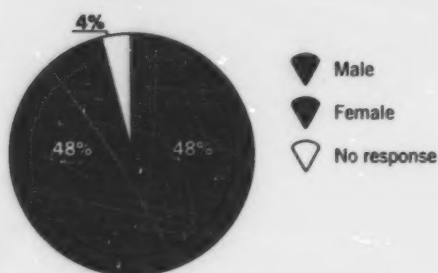


Profile of Students Who Wrote the Assessment – Academic

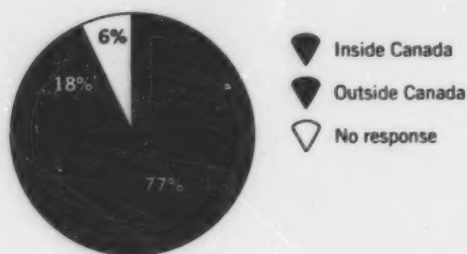
Number of Students

First semester	Second semester	Full year	Total number of students*
39 924	34 853	20 049	95 312

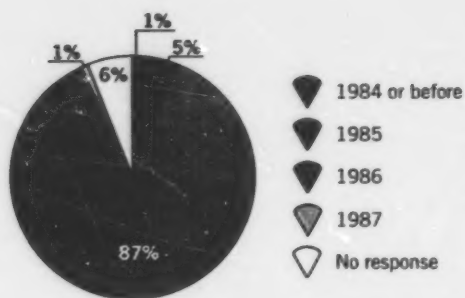
Gender



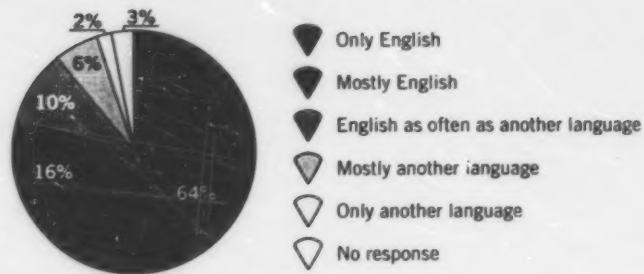
Place of birth



Year of birth



Language(s) spoken at home



"Academic courses develop students' knowledge and skills through the study of theory and abstract problems. These courses focus on the essential concepts of a subject and explore related concepts as well. They incorporate practical applications as appropriate."

The Ontario Curriculum, Grades 9 to 12: Program Planning and Assessment, 2000

* Some students did not indicate whether they were enrolled in a semestered or full-year course. As a result, there are some students who are not counted as part of the first semester, second semester or full-year statistics.

2000-2001: Overall Achievement – Academic¹

	<i>Exempt</i>	<i>No Data</i>	<i>Insufficient Information to Score</i>	<i>Below Level 1</i>	<i>Level 1</i>	<i>Level 2</i>	<i>Level 3</i>	<i>Level 4</i>
				Insufficient achievement of curriculum expectations.	A possible level of achievement. Achievement is below the provincial standard.	A moderate level of achievement. Achievement is below but approaching the provincial standard.	A high level of achievement. Achievement is at the provincial standard.	A very high to outstanding level of achievement. Achievement is above the provincial standard.
Method 1	1	1	3	6	14	26	44	5
Method 2	n/a	n/a	3	7	14	26	44	6

☐ **Method 1**

In Method 1 all data are reported. Method 1 expresses the number of students achieving each level as a percentage of all of the students in academic courses, including students who scored below Level 1, those who produced insufficient information to score, those who produced no data and those who were exempt.

Method 1 is EQAO's primary method of reporting because publicly funded schools are accountable for the achievement and progress of all students. Schools and school boards are required to use this method to ensure consistency of reporting across the province.

Due to rounding, percentages may not always total 100.

Overall levels as well as category and strand levels are adjusted for differences in assessments from administration to administration and from year to year.

☐ **Method 2**

Method 2 is an alternative way of presenting the data. Method 2 expresses student results as a percentage of those students who actually took part in the assessment and produced some work. Students who were exempt, or for whom there were no performance data, are excluded.

Method 2 highlights the results achieved by students who have at least some scorable work.

¹ The achievement chart setting out the percentages corresponding to each of the levels appears in Appendix A.

Overall Achievement in Grade 9 Mathematics — Academic, Semester 1

	Exempt	No Data	Insufficient Information to Score	Below Level 1	Level 1	Level 2	Level 3	Level 4
				Insufficient achievement of curriculum expectations.	A passable level of achievement. Achievement is <i>below</i> the provincial standard.	A moderate level of achievement. Achievement is <i>below but approaching</i> the provincial standard.	A high level of achievement. Achievement is <i>at</i> the provincial standard.	A very high to outstanding level of achievement. Achievement is <i>above</i> the provincial standard.
Method 1	1	1	4	7	14	28	39	5
Method 2	n/a	n/a	4	7	14	29	40	5

Overall Achievement in Grade 9 Mathematics — Academic, Semester 2

	Exempt	No Data	Insufficient Information to Score	Below Level 1	Level 1	Level 2	Level 3	Level 4
				Insufficient achievement of curriculum expectations.	A passable level of achievement. Achievement is <i>below</i> the provincial standard.	A moderate level of achievement. Achievement is <i>below but approaching</i> the provincial standard.	A high level of achievement. Achievement is <i>at</i> the provincial standard.	A very high to outstanding level of achievement. Achievement is <i>above</i> the provincial standard.
Method 1	4	1	2	6	14	25	46	5
Method 2	n/a	n/a	3	6	14	25	47	5

Overall Achievement in Grade 9 Mathematics — Academic, Full Year

	Exempt	No Data	Insufficient Information to Score	Below Level 1	Level 1	Level 2	Level 3	Level 4
				Insufficient achievement of curriculum expectations.	A passable level of achievement. Achievement is <i>below</i> the provincial standard.	A moderate level of achievement. Achievement is <i>below but approaching</i> the provincial standard.	A high level of achievement. Achievement is <i>at</i> the provincial standard.	A very high to outstanding level of achievement. Achievement is <i>above</i> the provincial standard.
Method 1	1	1	2	6	12	23	47	7
Method 2	n/a	n/a	2	6	13	24	48	7

Exemptions, Accommodations and Special Provisions — Academic

	<i>Receiving Special Education Support</i>	<i>Not Receiving Special Education Support</i>
Percentage of students who were exempt	2	1
Percentage of students who received accommodations and special provisions	2	< 1
Percentage of students who received accommodations	23	1
Percentage of students who received special provisions	1	1
Percentage of students who received no accommodations or special provisions	72	92
Percentage of students for whom information is missing	—	5

Overall Achievement by Gender — Academic (Girls)

	Exempt	No Data	Insufficient Information to Score	Below Level 1	Level 1	Level 2	Level 3	Level 4
				Insufficient achievement of curriculum expectations.	A passable level of achievement. Achievement is <i>below</i> the provincial standard.	A moderate level of achievement. Achievement is <i>below but approaching</i> the provincial standard.	A high level of achievement. Achievement is <i>at</i> the provincial standard.	A very high to outstanding level of achievement. Achievement is <i>above</i> the provincial standard.
Method 1	1	1	3	6	14	26	44	5
Method 2	n/a	n/a	3	7	14	27	44	5

Overall Achievement by Gender — Academic (Boys)

	Exempt	No Data	Insufficient Information to Score	Below Level 1	Level 1	Level 2	Level 3	Level 4
				Insufficient achievement of curriculum expectations.	A passable level of achievement. Achievement is <i>below</i> the provincial standard.	A moderate level of achievement. Achievement is <i>below but approaching</i> the provincial standard.	A high level of achievement. Achievement is <i>at</i> the provincial standard.	A very high to outstanding level of achievement. Achievement is <i>above</i> the provincial standard.
Method 1	1	1	4	6	13	25	44	6
Method 2	n/a	n/a	4	6	13	26	45	6

Overall Achievement by Language — Academic (Non-ESL)

	Exempt	No Data	Insufficient Information to Score	Below Level 1	Level 1	Level 2	Level 3	Level 4
				Insufficient achievement of curriculum expectations.	A passable level of achievement. Achievement is <i>below</i> the provincial standard.	A moderate level of achievement. Achievement is <i>below but approaching</i> the provincial standard.	A high level of achievement. Achievement is <i>at</i> the provincial standard.	A very high to outstanding level of achievement. Achievement is <i>above</i> the provincial standard.
Method 1	<1	1	3	6	14	26	44	5
Method 2	n/a	n/a	3	6	14	26	45	5

Overall Achievement by Language — Academic (ESL)

	Exempt	No Data	Insufficient Information to Score	Below Level 1	Level 1	Level 2	Level 3	Level 4
				Insufficient achievement of curriculum expectations.	A passable level of achievement. Achievement is below the provincial standard.	A moderate level of achievement. Achievement is below but approaching the provincial standard.	A high level of achievement. Achievement is at the provincial standard.	A very high to outstanding level of achievement. Achievement is above the provincial standard.
Method 1	15	1	6	11	14	19	29	6
Method 2	n/a	n/a	7	13	16	22	34	7

Overall Achievement by Special Education Support — Academic (Not Receiving Support)

	Exempt	No Data	Insufficient Information to Score	Below Level 1	Level 1	Level 2	Level 3	Level 4
				Insufficient achievement of curriculum expectations.	A passable level of achievement. Achievement is below the provincial standard.	A moderate level of achievement. Achievement is below but approaching the provincial standard.	A high level of achievement. Achievement is at the provincial standard.	A very high to outstanding level of achievement. Achievement is above the provincial standard.
Method 1	1	1	3	6	13	26	44	5
Method 2	n/a	n/a	3	6	14	26	45	6

Overall Achievement by Special Education Support — Academic (Receiving Support)

	Exempt	No Data	Insufficient Information to Score	Below Level 1	Level 1	Level 2	Level 3	Level 4
				Insufficient achievement of curriculum expectations.	A passable level of achievement. Achievement is below the provincial standard.	A moderate level of achievement. Achievement is below but approaching the provincial standard.	A high level of achievement. Achievement is at the provincial standard.	A very high to outstanding level of achievement. Achievement is above the provincial standard.
Method 1	2	1	4	10	17	24	38	4
Method 2	n/a	n/a	4	10	17	25	39	4

Achievement in Grade 9 Mathematics by Category — Academic

Knowledge/Skills Categories	Exempt	No Data	II S*	NET**	Level 1	Level 2	Level 3	Level 4
Knowledge/Understanding - understanding of concepts - performing algorithms, operations and procedures								
Method 1	1	1	5	4	12	21	53	4
Method 2	N/A	N/A	5	4	12	21	54	4
Application - selecting concepts, formulas, algorithms, tools to fit the information given								
Method 1	1	1	5	8	11	19	45	9
Method 2	N/A	N/A	5	8	11	20	46	9
Thinking/Inquiry/Problem Solving - reasoning - applying the steps of an inquiry/problem- solving process								
Method 1	1	1	7	11	20	20	33	7
Method 2	N/A	N/A	7	11	20	20	34	7
Communication - explaining reasoning - using mathematical language, symbols, visuals and conventions								
Method 1	1	1	6	2	13	34	42	1
Method 2	N/A	N/A	6	2	13	35	43	1

*Category scores are not adjusted for year-to-year differences in assessments.

**IIS = Insufficient Information to Score

***NE1 = Not Enough Evidence for Level 1

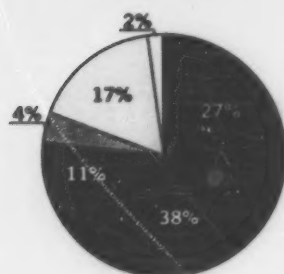
Achievement in Grade 9 Mathematics by Strand — Academic

Knowledge/Skills Strands	Exempt	No Data	IIS*	NET**	Level 1	Level 2	Level 3	Level 4
Number Sense and Algebra - applying essential numeric skills in solving new problems within a context (rather than in isolation) - applying algebraic concepts and skills (basic exponent rules, operations with first-degree polynomials and solving first-degree equations) necessary for the study and application of relations (e.g., solving multi-step problems requiring numerical answers, using a variety of strategies and tools)								
Method 1	1	1	6	4	12	24	49	3
Method 2	N/A	N/A	6	4	12	25	50	3
Relationships - identifying and understanding the properties of linear relations through the collection and interpretation of data from a variety of real-life situations and the creation of algebraic models for the data (e.g., determining relationships between two variables by collecting and analyzing data)								
Method 1	1	1	6	3	11	24	42	11
Method 2	N/A	N/A	7	3	11	24	43	11
Analytic Geometry - using various mathematical forms to demonstrate understanding of the geometry of the xy plane with a focus on linear relations and properties of slope (e.g., solving problems, using the properties of linear relations)								
Method 1	1	1	6	3	16	31	39	3
Method 2	N/A	N/A	6	3	16	31	40	3
Measurement and Geometry - understanding and using formulas and applications of three-dimensional figures to explore the relationships between measurement and geometry (e.g., relationship between volume and surface area, varying of one dimension on a measure) - Demonstrating an understanding of some properties of triangles and quadrilaterals (e.g., determining the optimal values of various measurements through investigations facilitated, where appropriate, by the use of concrete materials, diagrams and calculators or computer software)								
Method 1	1	1	7	7	14	24	45	1
Method 2	N/A	N/A	7	7	15	24	45	1

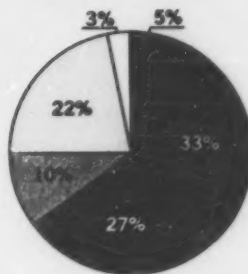
Findings from the Teacher and Student Questionnaires

Technology

Student access to computers during or after class

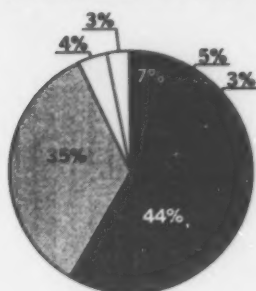


Student access to graphing calculators during or after class



- Never/Hardly Ever
- A few times during the course
- A few times a month
- A few times a week
- Daily
- No response

Availability of computers for mathematics instruction



- Computers for at least half the students
- Computers for less than half the students
- One computer in the classroom
- Computers available in the school but not in the classroom
- Computers difficult to access in the school
- No computers available
- No response

Availability of graphing calculators for mathematics instruction



- Calculators for most students in the class
- Calculators available for half the students in the class
- A few calculators available
- Calculators can be booked easily for this class
- Not enough calculators available in the school
- No calculators in the school
- No response

"Technology helps to make students more powerful learners by giving them the means to explore mathematical concepts more easily and quickly. In the time gained by using technology, students can study fundamental ideas in greater depth, and can concentrate their effort in the areas of data collection, data analysis, simulations, and complex problem solving."

The Ontario Curriculum, Grades 9 and 10: Mathematics, 1999

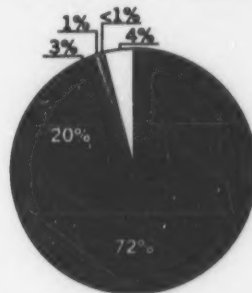
Technology (continued)

How often teachers use computers

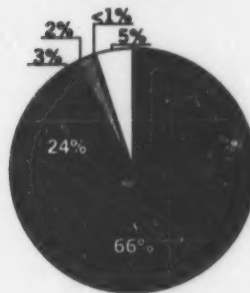
For doing practice drills



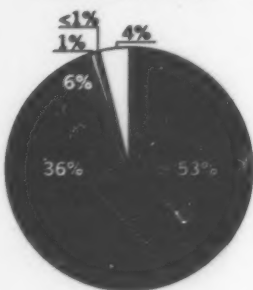
For simulating situations



For demonstrating a new topic



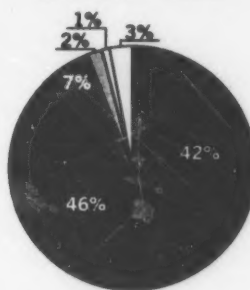
For exploring and investigating mathematical ideas and relationships



For building spreadsheets for the investigation of mathematical ideas and relationships



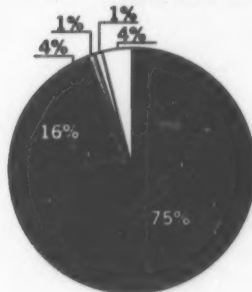
For using dynamic geometry software



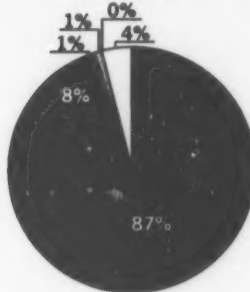
For collecting data using probes



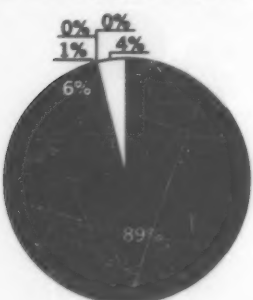
For solving problems



For exploring the Internet



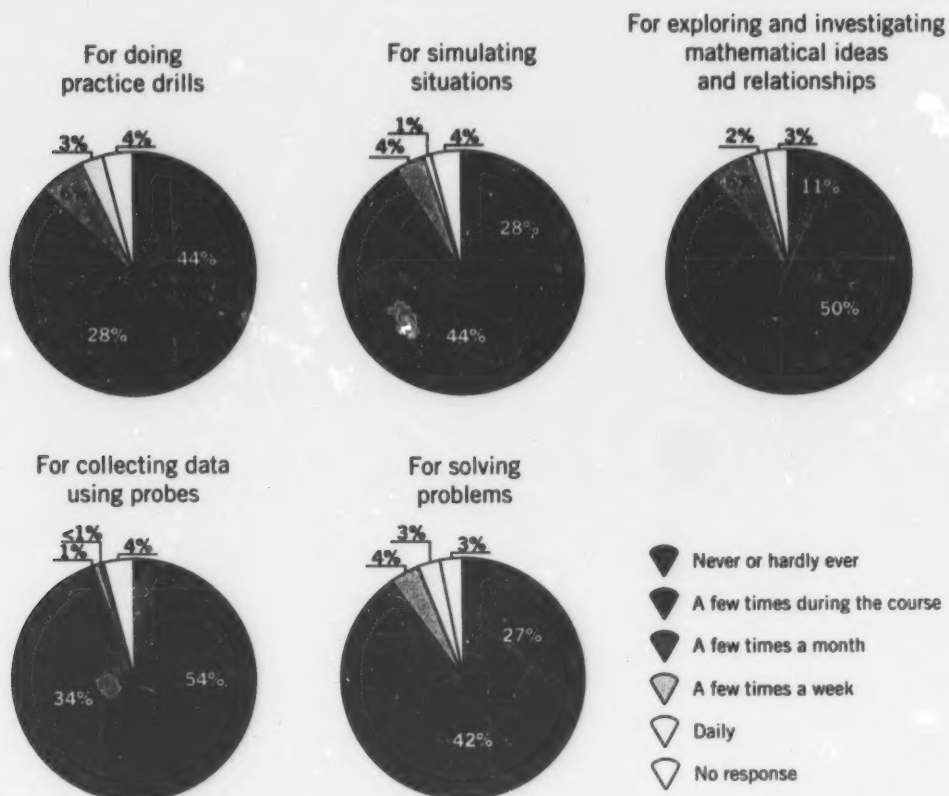
For making presentations



- ▼ Never or hardly ever
- ▼ A few times during the course
- ▼ A few times a month
- ▼ A few times a week
- ▼ Daily
- ▼ No response

Technology (continued)

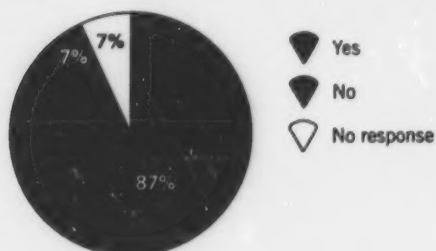
How often teachers use graphing calculators



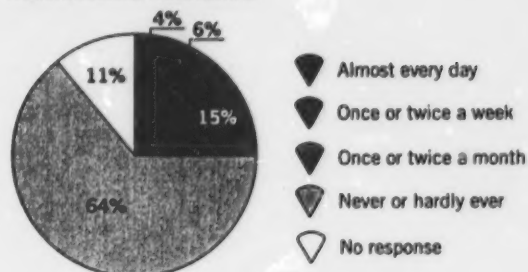
Technology (continued)

Student use of technology at home

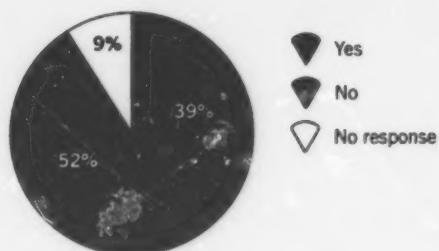
Students who have a computer at home for school work



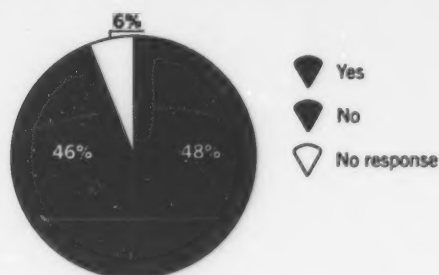
How often students use a home computer for mathematics homework



Students who have a scientific calculator at home for school work



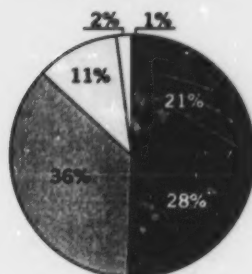
Students who have a graphing calculator at home for school work



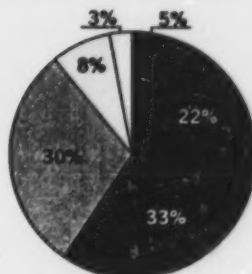
Teaching Strategies

How often teachers have students do the following:

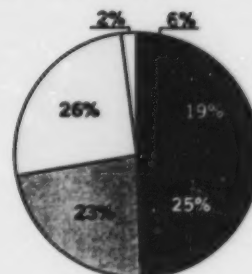
Apply mathematical concepts to authentic real-life contexts



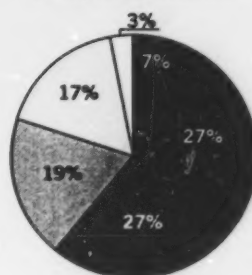
Use a variety of problem-solving strategies for finding answers



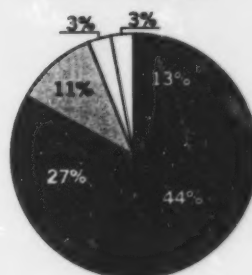
Use scientific calculators to do mathematics in problem-solving environments



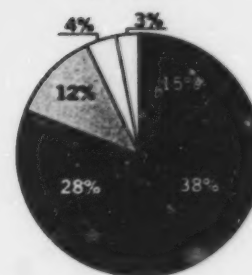
Use scientific calculators, when appropriate, to explore and learn mathematics and to explore patterns



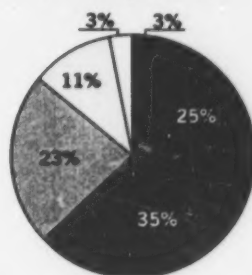
Use concrete materials to investigate and gain an understanding of new concepts



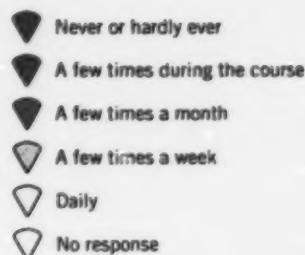
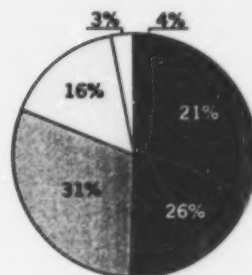
Solve open-ended problems



Work collaboratively to solve problems



Discuss problem-solving choices and strategies in class



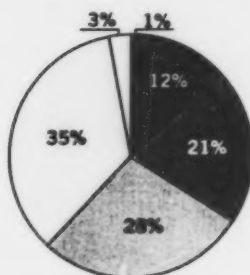
"Students in a mathematics class typically demonstrate diversity in the ways they best learn. It is important, therefore, that students have opportunities to learn in a variety of ways – individually, cooperatively, independently, with teacher direction, through hands-on experience, through examples followed by practice.

...Because there is no single, correct way to teach or to learn mathematics, the nature of this curriculum demands that a variety of strategies be used in the classroom. It is assumed that the strategies used will vary according to the object of the learning and the needs of the students."

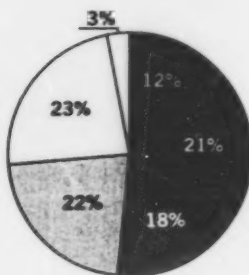
The Ontario Curriculum, Grades 9 and 10: Mathematics, 1999

Teaching Strategies (continued)

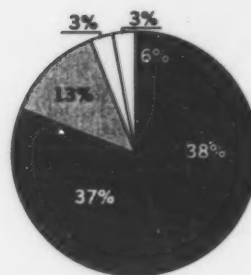
Discuss mathematical ideas and relationships



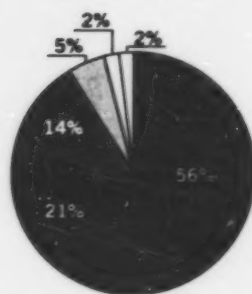
Practise mental mathematics



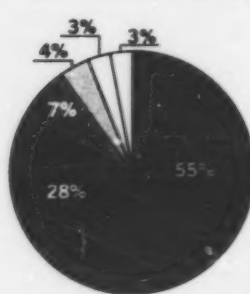
Conduct mathematical investigations



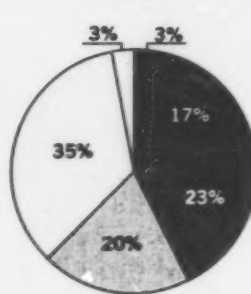
Engage in mathematics journal writing



Have conferences with the teacher to demonstrate communication with appropriate mathematical language



Write solutions in precise mathematical language



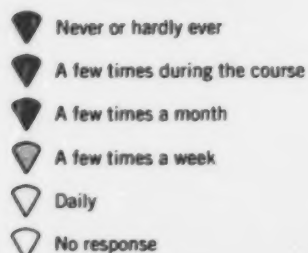
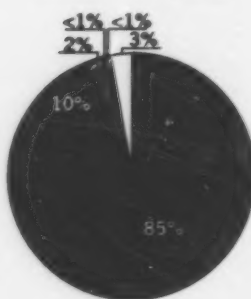
Demonstrate a mathematical process to other students



Watch mathematics videos

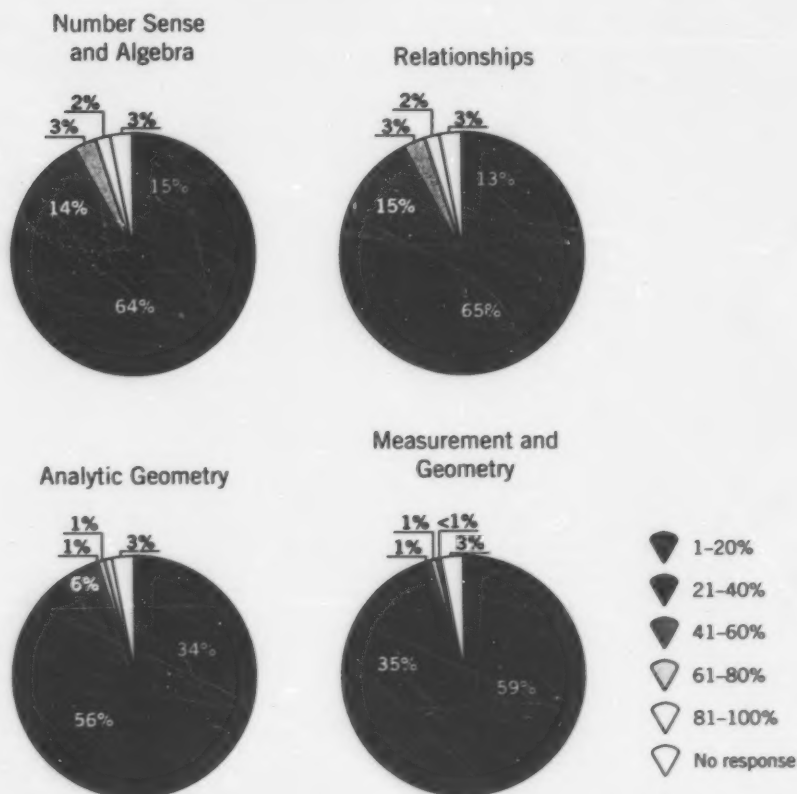


Use the Internet to find secondary data



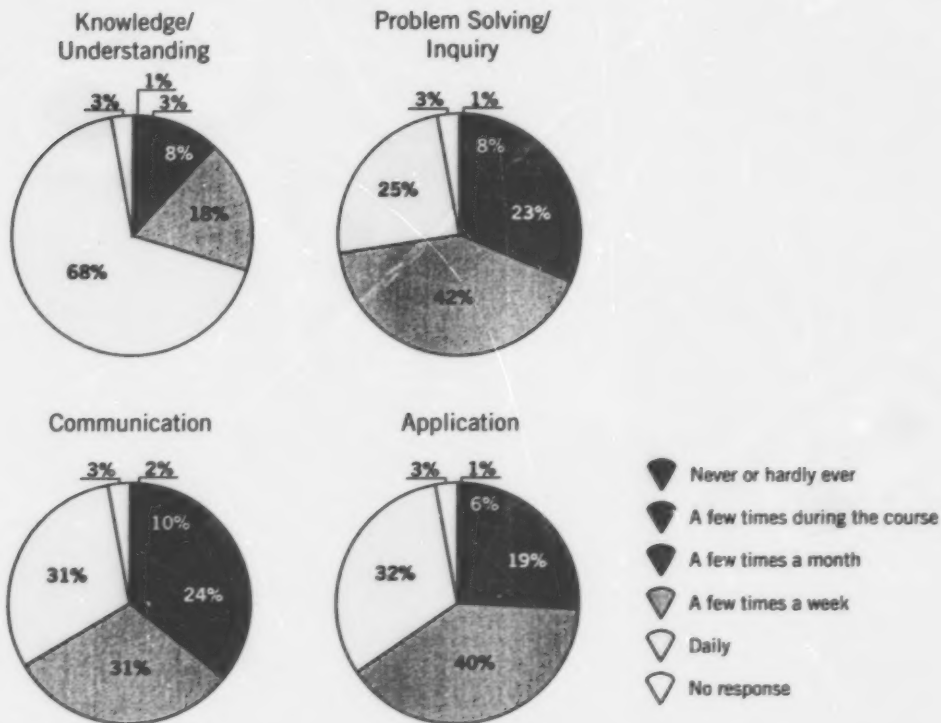
Teaching Strategies (continued)

Percentage of course time teachers spend on the following mathematics strands:



Teaching Strategies (continued)

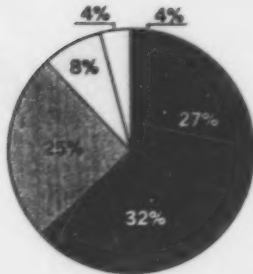
How often teachers have students do activities related to the following achievement categories:



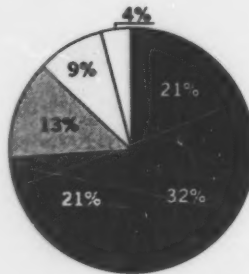
Classroom Assessment

How often teachers use the following materials and strategies in assessing students' progress in mathematics:

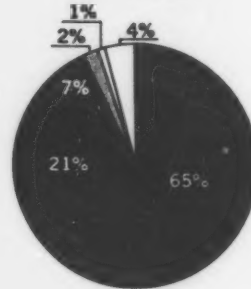
Apply mathematical concepts to authentic real-life contexts



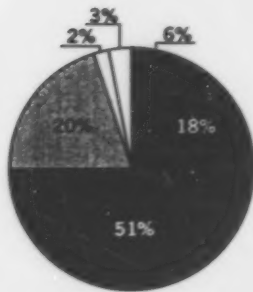
Observation notes and/or checklists



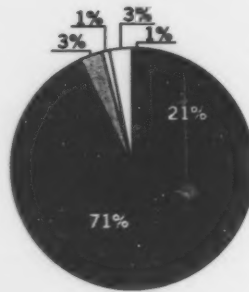
Conferences about mathematics



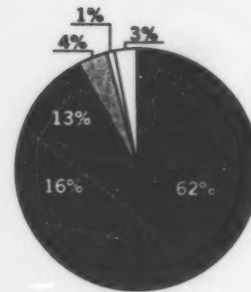
Small diagnostic paper-and-pencil tests



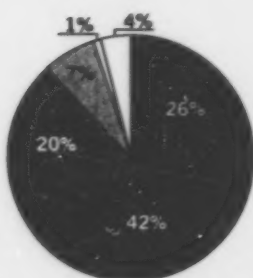
End-of-chapter tests



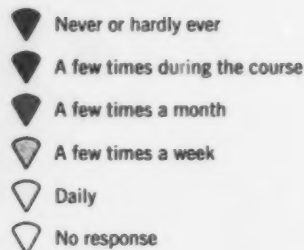
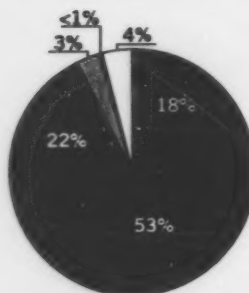
Mathematics journals



Demonstrations with materials



Investigations

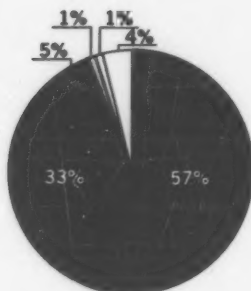


"Assessment and evaluation of student achievement provide teachers with an opportunity to think critically about their methods of instruction and the overall effectiveness of their program. Teachers and principals should systematically review course content, instructional strategies, and assessment procedures and make the program changes needed to improve their students' achievement."

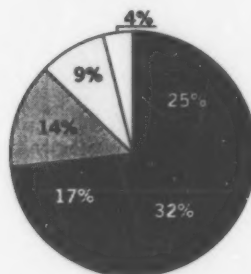
The Ontario Curriculum, Grades 9 to 12: Program Planning and Assessment, 2000

Classroom Assessment (continued)

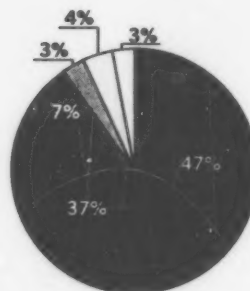
Results of work done on the computer



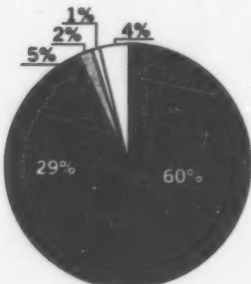
Demonstrations of mental mathematics ability and estimation



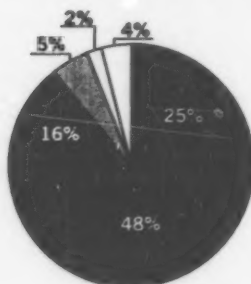
Self assessment



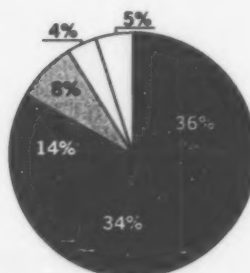
Peer assessment



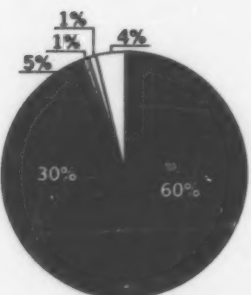
Solution of open-ended questions



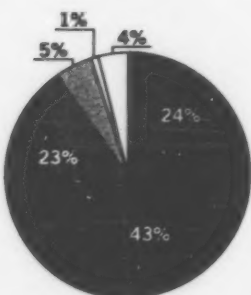
Student presentations of solutions to other students



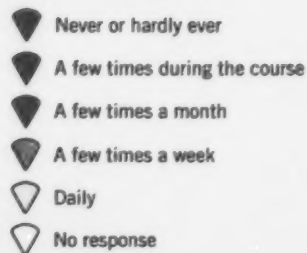
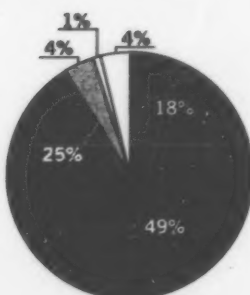
Construction of physical/concrete materials



Rubrics related to the achievement charts

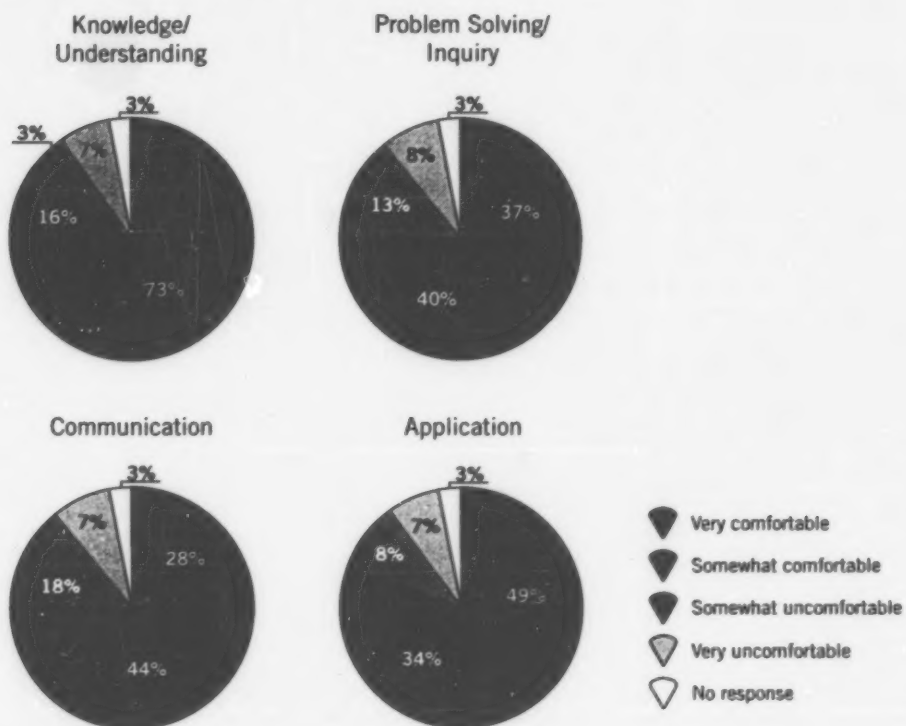


Results of work done on a graphing calculator



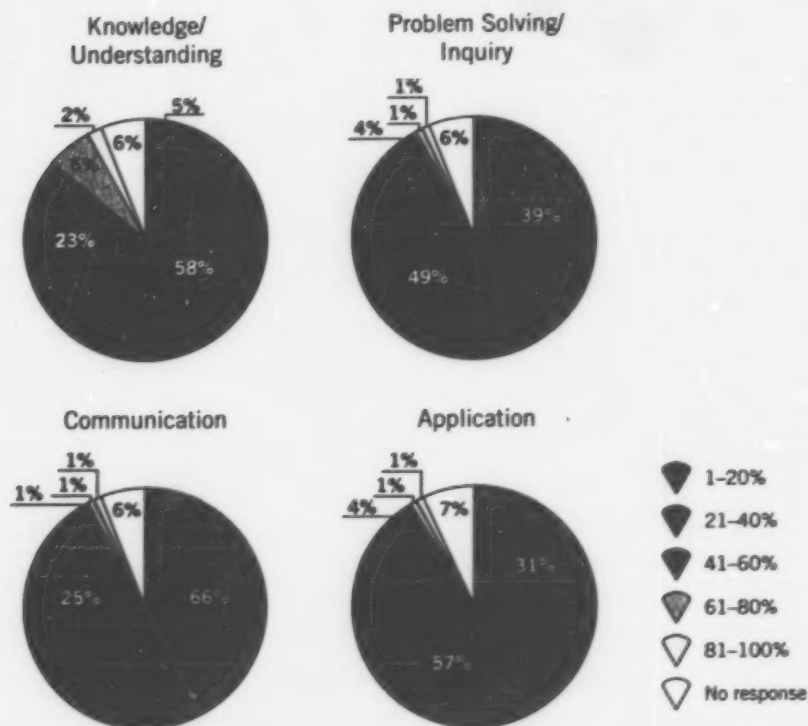
Classroom Assessment (continued)

How comfortable teachers are in assessing student achievement in the following achievement categories:

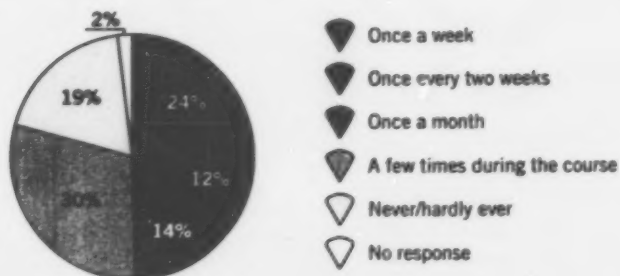


Classroom Assessment (continued)

Percentage of a students' final mark in mathematics that was based on each of the following achievement categories:

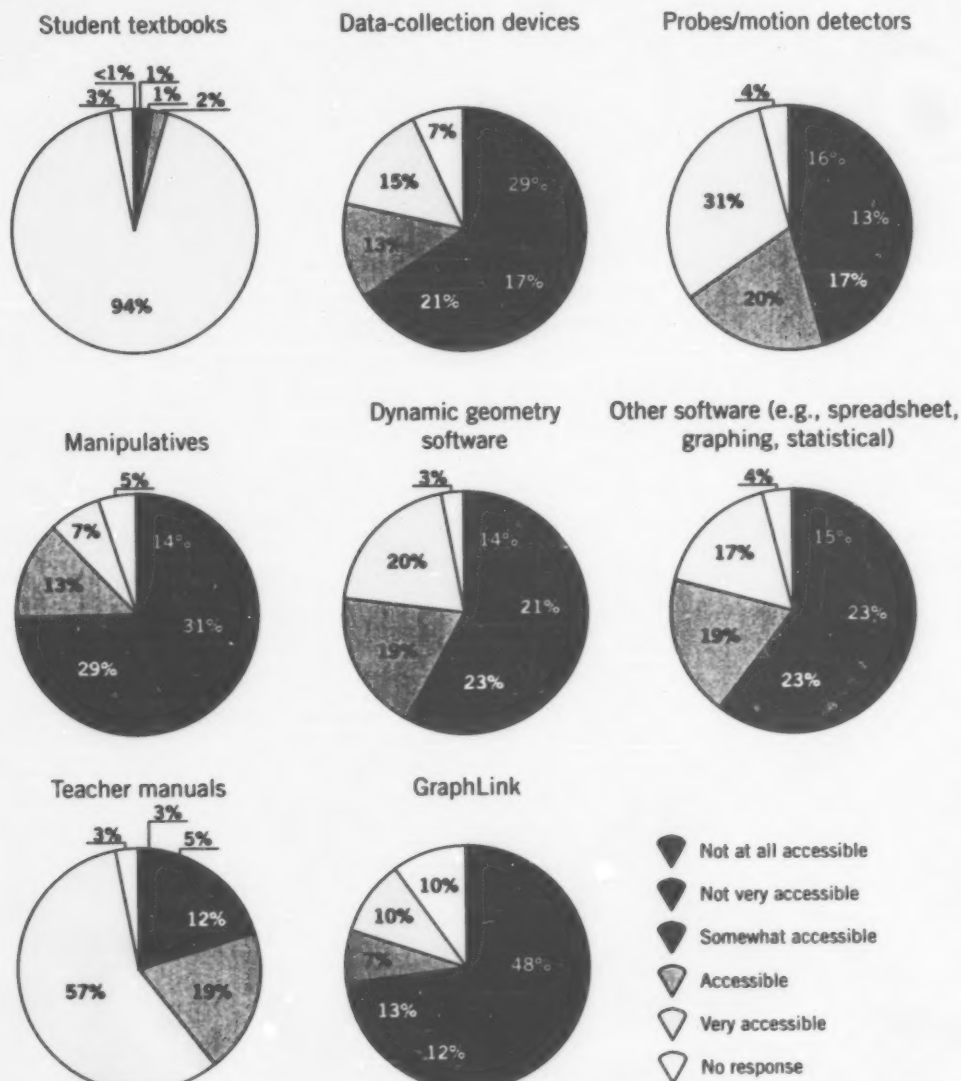


How often teachers meet with other mathematics teachers to plan or discuss curriculum and/or assessment

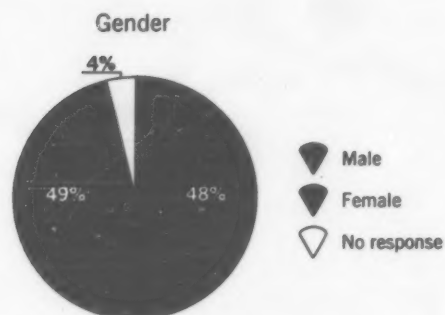


Availability of Instructional Materials and Learning Resources

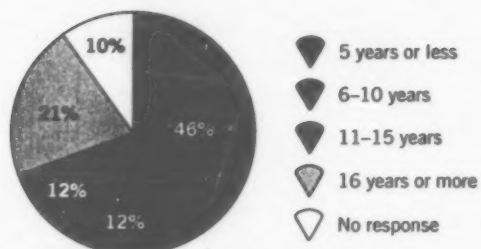
Degree to which the following instructional materials are accessible to teachers and the students in their classrooms



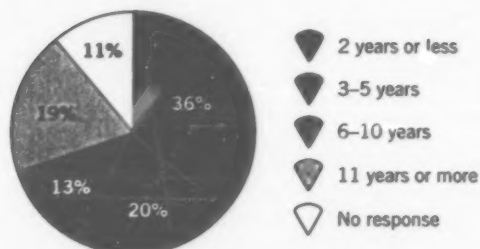
Teacher Population, Qualifications and Experience



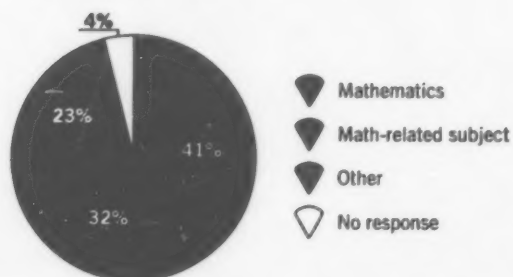
Number of years, including the current year, that teachers have been teaching mathematics at the secondary level



Number of years, including the current year, that teachers have been teaching Grade 9 mathematics



Teachers' major area of study while studying to obtain their bachelor's degree (or equivalent)



Teacher Population, Qualifications and Experience (continued)*Teachers who have completed or are presently working towards the following:*

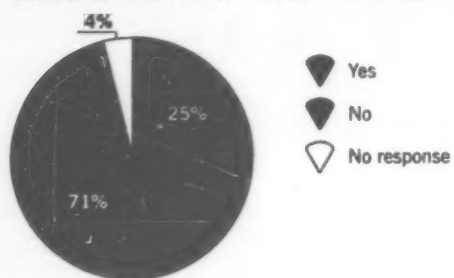
Additional basic qualifications in mathematics	30%
Three-session qualifications in mathematics — intermediate and senior education	25%
Honours specialist qualification in mathematics	31%

Teachers who have extended personal knowledge of mathematics instruction through the following:

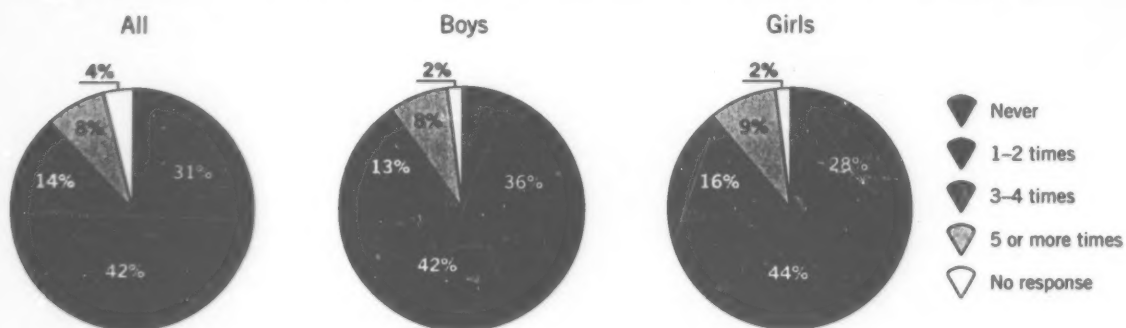
Participating in school-based workshops or seminars	74%
Participating in board-level workshops or seminars	67%
Participating in provincial-level conferences	29%
Writing curriculum materials at the school level	47%
Writing curriculum materials at the board level	11%
Writing curriculum materials at the provincial level	2%
Reading professional materials	82%
Visiting other classrooms	48%
Working with colleagues on projects related to curriculum and assessment	75%
Taking university or community college courses	19%
Marking large-scale assessments with EQAO	7%
Developing large-scale assessments with EQAO	3%
Searching the Internet for resources and techniques	67%
Attending summer institutes	26%
Consulting with colleagues on matters of curriculum and assessment	92%
Participating in class research projects	15%

Student Attendance and Homework

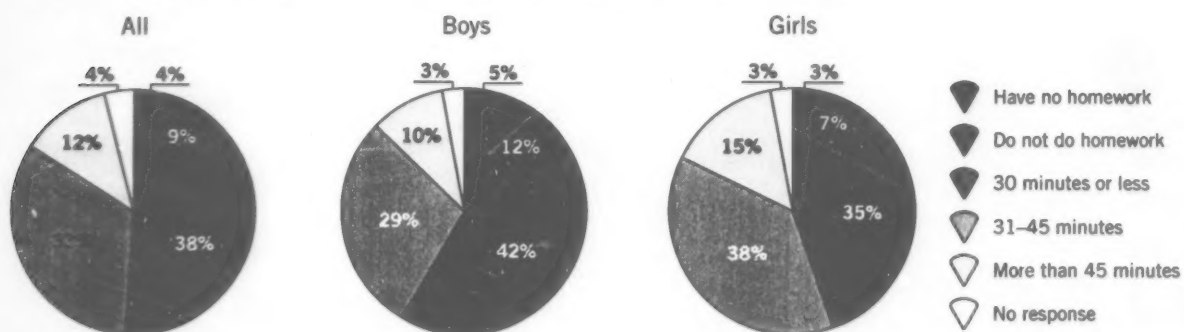
Students who have missed more than two weeks of school over the past year



Number of times students were absent from mathematics class during the previous month



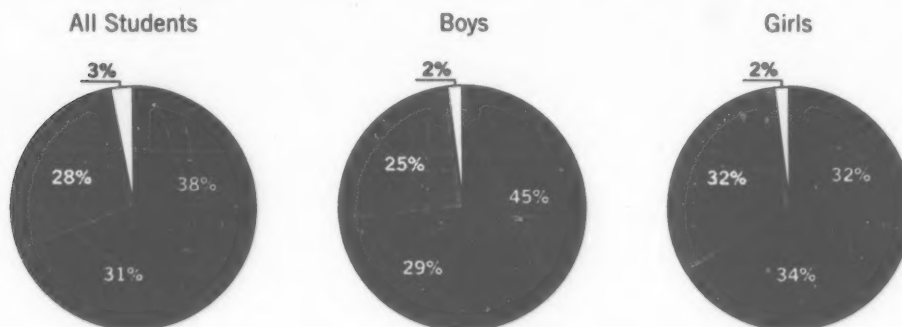
Time students usually spend on mathematics homework on any given day



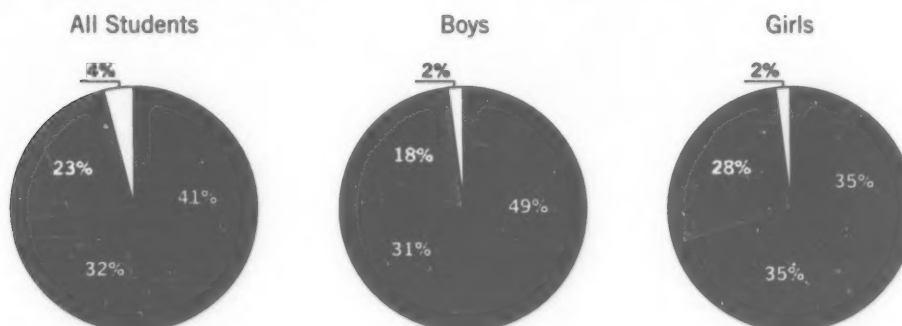
Student Attitudes towards Mathematics

Degree to which students agree or disagree with the following statements:

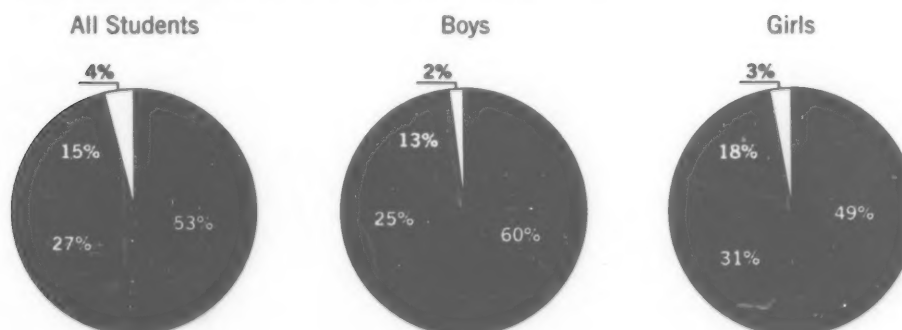
I like mathematics.



I am good at mathematics.

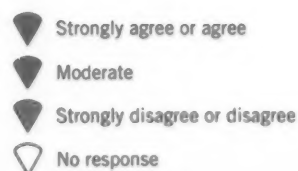


I understand most of the mathematics I am taught.



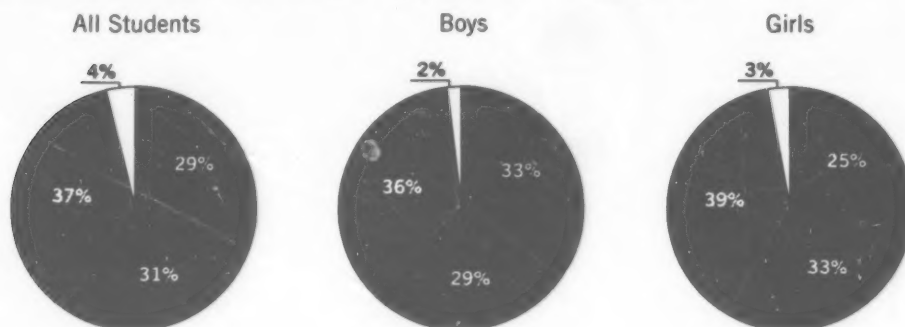
"Mathematics anxiety is a state of mind relating to a student's perception of his or her ability to do mathematics. It is neither grade specific nor exclusively gender related. If left unchecked, it often leads to mathematics avoidance."

The Ontario Curriculum, Grades 9 and 10: Mathematics, 1999

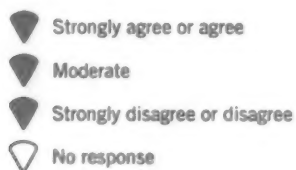
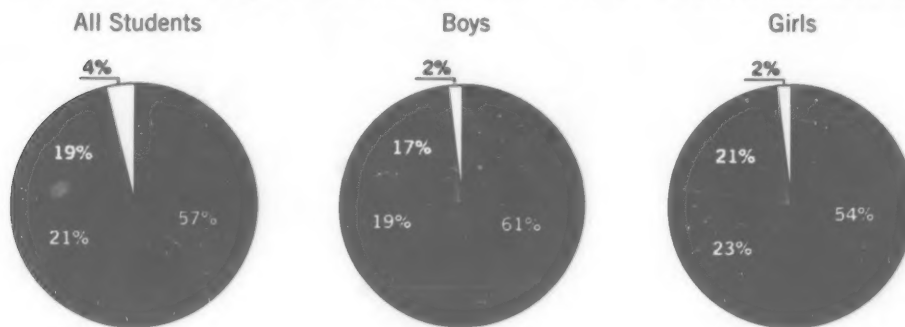


Student Attitudes towards Mathematics (continued)

The mathematics I learn now is very useful for everyday life.



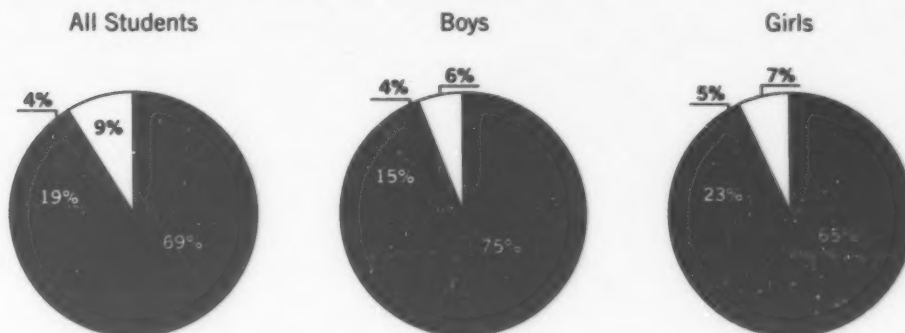
I need to keep taking mathematics for the kind of job I want after I leave school.



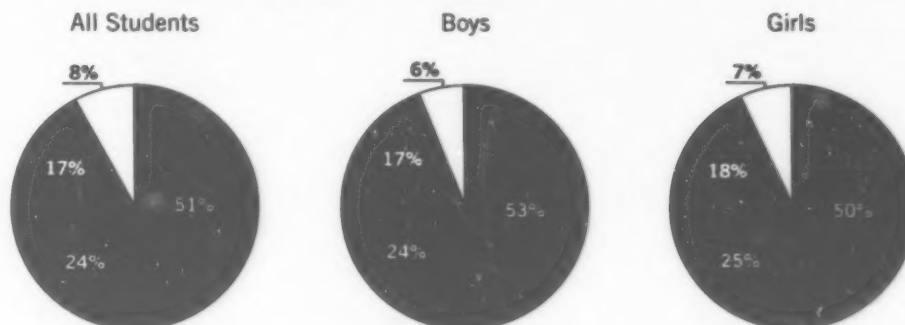
Student Attitudes towards Mathematics (continued)

How easy or hard students find the following:

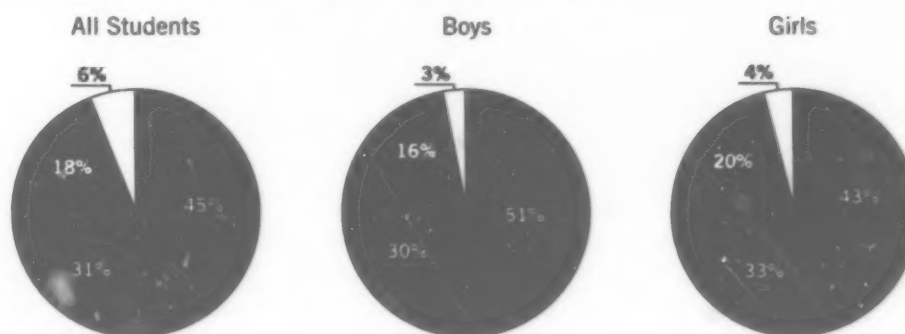
Mathematics questions that deal with number sense



Mathematics questions that deal with algebra

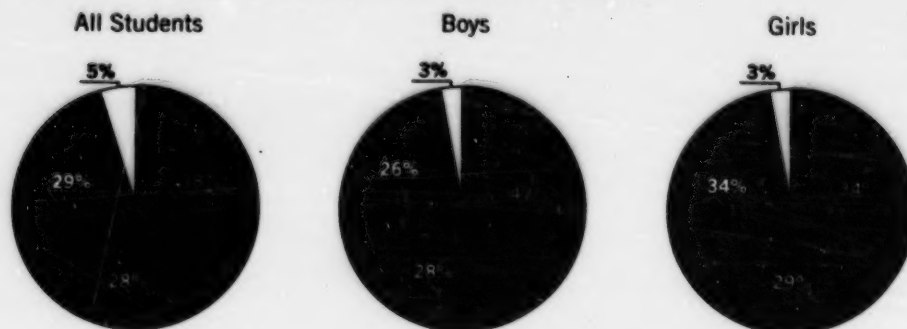


Mathematics questions that deal with relationships

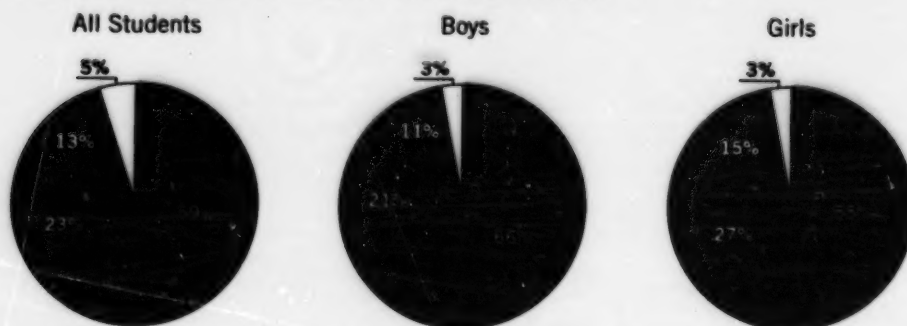


Student Attitudes towards Mathematics (continued)

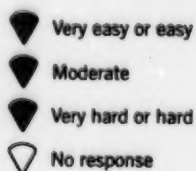
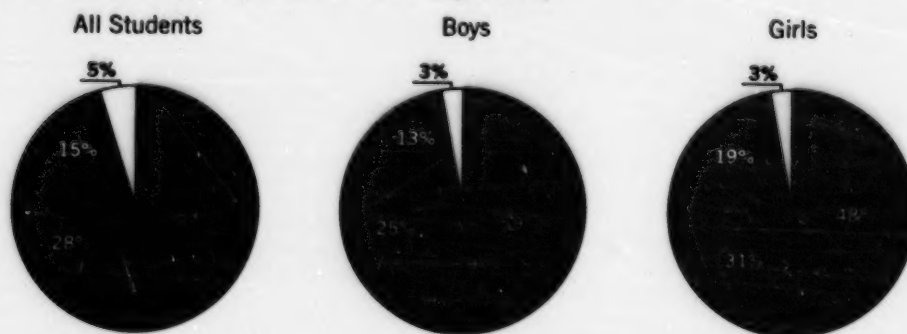
Mathematics questions that deal with analytic geometry



Mathematics questions that deal with measurement



Mathematics questions that deal with geometry





Quality Assurance

Quality assurance helps to ensure that EQAO's assessments produce valid and reliable data. Quality assurance mechanisms are embedded in each stage of the assessment cycle for the Grade 9 Assessment of Mathematics and the Ontario Secondary School Literacy Test (OSSLT), including design and development, piloting, field testing and revision, administration, marking and reporting. Quality assurance information collected during and at the end of each assessment cycle is used to review and improve assessment policies and procedures.

Stage One: Design and Development

Quality Assurance Procedures

- A technical committee of assessment experts guides design and development to ensure consistency with EQAO values and sound assessment practices.
- EQAO personnel direct, monitor and support the work of development teams.
- A validation team of educators and assessment experts examines test materials for bias and appropriateness.
- English and French development teams work collaboratively to ensure the comparability of assessments.

Stage Two: Piloting, Field Testing and Revisions

Quality Assurance Procedures

- EQAO quality assurance monitors visit field-test sites and record observations.
- Using a questionnaire and making anecdotal comments, field-test teachers record their reactions to administration directions and assessment materials and their observations on student reactions.
- Using questionnaires, EQAO monitors field-test marker training.
- The technical committee approves the final form of the assessment.
- The validation team approves the final form of the assessment.

Components of the 2000–2001 Grade 9 Assessment of Mathematics were pilot-tested with over 15 000 students in a cross-section of schools across the province. The teachers who administered the tests were asked to record the time it took students to complete the activities. This information was then used by EQAO staff to adjust both the number of items and the specified times in the *Guide and Teacher's Daily Scripts for Administering the Grade 9 Assessment of Mathematics*.

Stage Three: Administration

Quality Assurance Procedures

Quality assurance procedures are in place to ensure that all assessment materials meet EQAO specifications.

EQAO monitors the training of teachers to administer the assessment.

EQAO makes on-site visits to at least 10% of the participating classrooms to collect data on how accurately and consistently teachers and principals are following the test administration procedures.

EQAO also makes follow-up visits to schools where irregularities are reported or identified.

THE GRADE 9 ASSESSMENT OF MATHEMATICS, JANUARY AND JUNE 2001

Quality assurance monitors visited classes in nearly 120 schools across the province, including academic classes, applied classes and classes with both academic and applied courses. The schools visited were selected at random.

In each school, monitors recorded information acquired through an interview with the principal, a discussion with the teacher and classroom observation of the administration. All monitors had experience as teachers, principals, consultants, supervisory officers or education officers.

Some highlights

- In nearly all schools, classrooms were appropriately set up and teachers followed the timelines and procedures specified in the administration guide.
- Monitors reported no significant problems or concerns regarding test security or confidentiality.
- Monitors reported that, in general, students were well behaved, focused and attentive to the task. However, students in some applied classes had difficulty sustaining interest and attention. Several monitors noted that students in these classes gave up quickly or lost interest when they encountered questions that they did not understand.
- Seventy-eight percent of teachers reported that they had received some form of training. Seventeen percent indicated that they had received no training at all. The training that teachers did receive was uneven. It ranged from half-day sessions organized by the school board for all mathematics teachers to simply reading the administration guide.

Stage Four: Marking

Quality Assurance Procedures

There are different scoring procedures for the Grade 9 Assessment of Mathematics and the OSSLT, reflecting the different mandates of these two tests. Quality assurance checks are built into the scoring procedures for each test to ensure maximum precision and consistency. Detailed information is available on the EQAO Web site at www.eqao.com.

THE MARKING

Student work from the January 2001 and June 2001 administrations of the Grade 9 assessment was marked separately. Approximately 700 teachers and principals took part in each marking session.

Some highlights

- Ninety-six percent of January 2001 markers and 90% of June 2001 markers reported that the training they received was very effective or generally effective in preparing them to score student work.
- Ninety-six percent of January 2001 markers and 94% of June 2001 markers were very confident or generally confident in their ability to score student work accurately.
- Ninety-eight percent of January 2001 markers and 91% of June 2001 markers reported that working in pairs in the early stages of marking and the opportunity to consult with another markers when needed were very effective or generally effective in helping them develop and maintain accuracy.
- Nearly 90% of markers in both sessions reported that the marking experience provided very valuable or generally valuable

Number of Individual Student Reports (ISRs) generated for the Grade 9 Assessment of Mathematics, 2000-2001: 136 000

Number of School Reports generated: 650

Number of School Board Reports generated: 62

Stage Five: Reporting

There are four kinds of reports for each assessment: individual, school, school board and provincial.

EQAO provides Individual Student Reports (ISRs) to students, parents and teachers. For the Grade 9 Assessment of Mathematics, the ISR contains an overall achievement level as well as strand and category achievement levels, which provide more detailed information about the student's knowledge and skills in specific areas of the mathematics curriculum. For the OSSLT, the ISR indicates whether the student successfully completed the test. If the student is unsuccessful on the test, the ISR provides specific feedback about the skills that need additional attention.

Schools and school boards prepare their own reports for the Grade 9 Assessment of Mathematics and the OSSLT. These local reports contain achievement data as well as contextual data from EQAO questionnaires and other sources.

Finally, the *Provincial Report on Achievement* is published annually and contains results from the assessments, as well as summaries of the questionnaire data and recommendations for school and system improvement.

Quality Assurance Procedures

EQAO has data management procedures in place to ensure data are recorded and correctly attributed to individual students, schools and school boards. EQAO also has procedures for conducting a review of individual student results at the request of a student or parent.

MONITORING ASSESSMENT COMPLIANCE

EQAO staff and data analysts are trained to detect irregularities in the administration and/or marking of the assessments that may require further investigation and action. These problems may be identified during the administration of the assessments, during marking or during the subsequent data analysis process. EQAO also follows up on any irregularities that are reported to it.

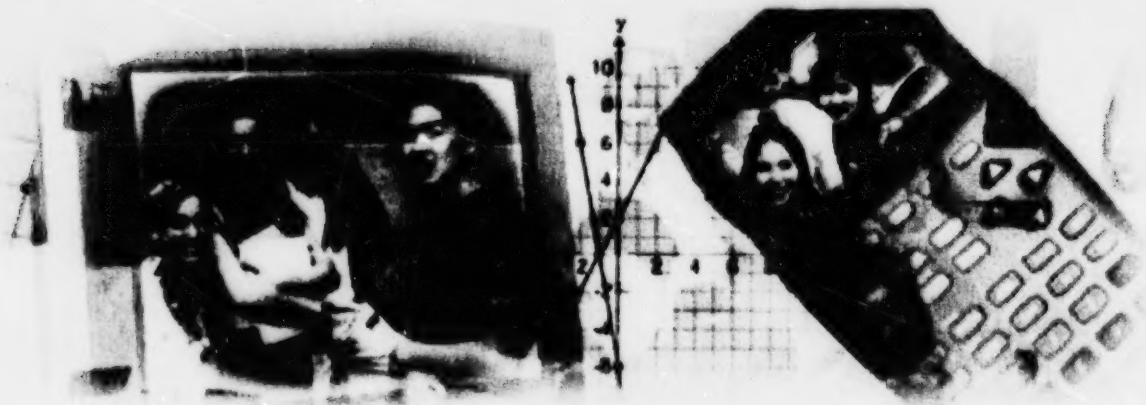
EQAO, along with school and school board officials, investigates any reported irregularities. Depending on the severity of the situation, EQAO may have to invalidate the results of a student or group of students.

Review and Improvement of Assessment Policies and Procedures

EQAO uses quality assurance data and feedback gathered at each stage of the assessment cycle to review and modify the assessment instruments, materials and processes. In addition, after each administration, EQAO reviews the entire assessment and makes changes for the following year.

SOME MODIFICATIONS AND REVISIONS AFFECTING THIS YEAR'S GRADE 9 ASSESSMENT OF MATHEMATICS:

- As a result of student and teacher feedback from the pilot tests, EQAO modified the assessment to ensure that the time allocations and both the number and the sequencing of items were appropriate.
- Based on input from teachers and principals, EQAO decided to hold the first administration of the assessment in January rather than in December as originally planned.
- In response to questions from principals and school boards about dealing with situations that might disrupt the administration of an EQAO assessment, EQAO developed the *Policy on Cancelling or Discontinuing the Administration of an EQAO Assessment*.



General Recommendations

Introduction

A central part of EQAO's mandate is to make recommendations for improvement based on its annual province-wide assessments.

This report contains general recommendations that build on data from the first annual Grade 9 Assessment of Mathematics, which was administered during the 2000–2001 school year.¹

Baseline Information

As with all initial assessment data, this year's Grade 9 assessment data provide baseline information that should be interpreted with caution. Data collected through future administrations of the assessment will provide a clearer picture of student achievement and will allow parents, educators, students and Ontarians to measure improvements in student achievement over time.

Category/Strand Results

This report provides overall achievement results for the province as well as category and strand results, which provide more detailed information about student achievement in specific areas of the mathematics curriculum.

¹ The recommendations in this report do not address the Ontario Secondary School Literacy Test (OSSLT) since the OSSLT was administered on a trial basis in 2000–2001. Starting in 2001–2002, the OSSLT will be administered annually and successful completion of the test will be an Ontario Secondary School Diploma requirement. EQAO will report student results annually, along with recommendations for improvement.

School board and schools receive overall achievement results as well as category and strand achievement results in specific areas of the mathematics curriculum. At the school board and school levels, educators, students and parents should use the category and strand results to improve classroom programs and instructional planning. Schools will find it useful to compare their category and strand results with the same results at the board and provincial levels. Likewise, school boards will find it useful to compare their category and strand results with those at the provincial level.

The Mathematics Curriculum

The current secondary mathematics curriculum was introduced in 1999 and is at an early stage of implementation. This new curriculum is linked to *The Ontario Curriculum, Grades 1–8: Mathematics* (which was introduced in 1997–1998) and builds on the concepts and skills expected of students by the end of Grade 8. The students who wrote the 2000–2001 assessment had limited exposure to the new elementary curriculum and the results for this cohort should be interpreted with this factor in mind. In addition, at the time the 2000–2001 Grade 9 assessment was administered, Grade 9 mathematics teachers were in their second year of working with the new secondary curriculum.

Semestered and Full-Year Classes

This report provides achievement data for first-semester, second-semester and full-year courses. Since the relative benefits of non-semestering and semestering remain a subject of debate within and outside the education community, EQAO will be reporting these data each year. However, it is important not to draw any firm conclusions until sufficient data are available and a comprehensive analysis has been done.

General Recommendations

1. That school boards, in consultation with their communities, incorporate the overall, category and strand data from the 2000–2001 Grade 9 Assessment of Mathematics into their existing board action plans for improvement and, using the mathematics data they have accumulated from the Grade 3 and Grade 6 assessments, develop a framework for improving student achievement in mathematics that extends across the elementary and secondary grades.
2. That school boards, principals and teachers, in consultation with students, parents and school councils, examine the category and strand data in order to identify areas in the mathematics curriculum where students demonstrate strength and areas where additional emphasis and effort are required.

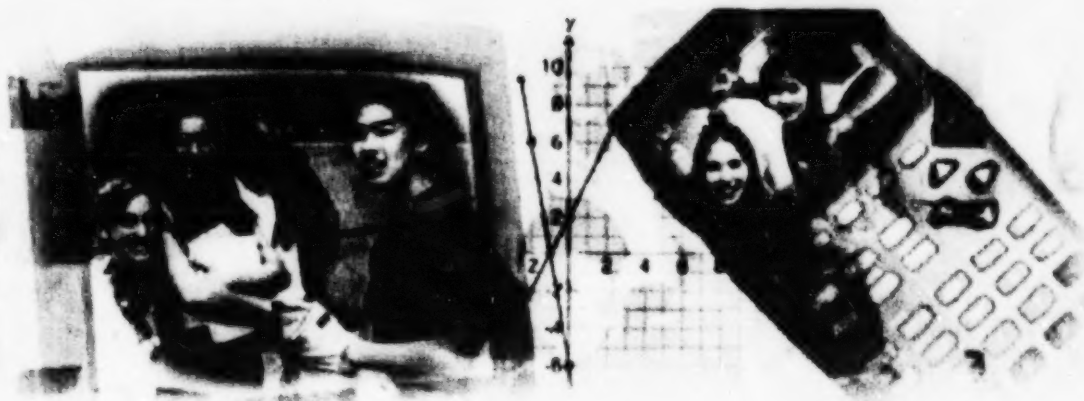
"Today's mathematics curriculum must prepare students for their tomorrows. It must equip them with essential mathematical knowledge and skills; with skills of reasoning, problem solving, and communication; and, most importantly, with the ability and incentive to continue learning on their own."

The Ontario Curriculum, Grades 9 and 10: Mathematics, 1999

3. That school boards, principals and teachers examine the teacher and student questionnaire data for applied courses and ensure that the strategies and resources being used to teach and assess applied courses appropriately reflect the focus of applied courses, the provincial curriculum expectations for applied courses and the needs and motivation of students in applied courses.
4. That school boards, principals and teachers, in consultation with students, parents and school councils review the achievement and questionnaire data for academic courses and determine what additional steps need to be taken in order to increase the percentage of students reaching the provincial standard.
5. That school boards, when incorporating data from the 2000–2001 Grade 9 assessment into their action plan for improvement, pay particular attention to strategies, programs and supports that will motivate and assist students who are currently achieving below Level 1 or at Level 1 or 2 so that these students can strengthen their knowledge and skills and, over time, achieve the higher levels.
6. That school boards, in consultation with parents, students and school councils, monitor the achievement of students in semestered and full-year mathematics courses on the annual Grade 9 assessment and begin compiling data on the effectiveness of semestered and full-year courses in meeting students' mathematics learning needs.
7. That the Ministry, school boards, principals and teachers, recognizing the strong emphasis that the mathematics curriculum places on using technology to enhance student learning, review the availability and use of computers, dynamic geometry software, graphing calculators and other technologies and integrate these technologies into instructional planning and learning activities.
8. That teachers use the sample questions, tasks and student work from the 2000–2001 assessment (available on EQAO's Web site) to help students understand how questions and tasks relate to the category and strand expectations in the mathematics curriculum.
9. That school boards, principals and teachers, in partnership with students, parents and school councils, take further steps to help students understand the relevance of mathematics to learning in other subject areas, to everyday life outside school and to future educational and career opportunities.

"Both [applied and academic] courses set high expectations for students while preparing them for studies in the senior grades. The two types of courses differ in the balance between essential concepts and additional material, and in the balance between theory and application. In planning courses of study, teachers should take into account the need to adapt instructional approaches and materials to reflect the differences between the two types of courses."

The Ontario Curriculum, Grades 9 to 12: Program Planning and Assessment, 2000



Third International Mathematics and Science Study

Repeat Project (TIMSS-R)

The Third International Mathematics and Science Study (TIMSS), a project of the International Association for the Evaluation of Educational Achievement (IEA), was designed to compare the teaching and learning of mathematics and science in elementary and secondary schools around the world. The first round of TIMSS data collection occurred in 1995 at Grades 3/4, 7/8 and the end of secondary school (Grade 12/OAC in Ontario). A repeat project (TIMSS-R) was conducted in 1999.

In May 1999, a nationally representative sample of several thousand Canadian Grade 8 students took part in TIMSS-R. For those countries and provinces (including Ontario) that participated in both the original TIMSS and TIMSS-R, it was possible to compare the student achievement results of the student cohort that was in Grade 4 in 1995 and in Grade 8 in 1999. Five provinces drew large enough school and student samples (over-sampled) to generate representative, generalizable provincial statistics: British Columbia, Alberta, Ontario, Quebec and Newfoundland. In Ontario, 4054 students from 112 English- and 74 French-language schools participated in the study.

TIMSS-R involved student testing, as well as student, teacher and school questionnaires to collect contextual information about instruction and learning. All of the students wrote a 90-minute test in mathematics and science and completed a student questionnaire that gathered information about their classroom activities, home background, out-of-school activities and their attitudes toward mathematics and science. The mathematics and science teachers of sampled students were asked

about their teaching emphasis, instructional practices, textbook usage, professional training and education, as well as their views on mathematics and science. School principals responded to questions about school staffing and resources, mathematics and science course offerings and teacher support.

What EQAO Learned about Mathematics and Science Achievement

- In both mathematics and science, Ontario Grade 8 student achievement was the same as that in Canada overall. (In 1995, Ontario Grade 8 students scored lower than Canada as a whole in both mathematics and science.)
- Among the five provinces that over-sampled, only Quebec Grade 8 students achieved higher scores than Ontario students in mathematics; Alberta, British Columbia and Quebec students scored higher than Ontario students in science.
- In mathematics, Ontario Grade 8 student achievement scores (Ontario English and Ontario French) were significantly higher than the international average in all five content areas: fractions and number sense, measurement, data representation analysis and probability, geometry and algebra. (In 1995, Ontario Grade 8 students performed at about the international average overall but scored lower than the international average in geometry, algebra and measurement.)
- In science, Ontario Grade 8 student achievement scores (Ontario overall and Ontario English) were significantly higher than the international average in all six content areas: earth science, life science, physics, chemistry, environmental and resource issues and scientific inquiry. Ontario French students scored higher than the international average in scientific inquiry; the same as the international average in earth science, life science and physics; and lower than the international average in chemistry and environmental and resource issues. (In 1995, Ontario Grade 8 students performed at about the international average overall but scored lower than the international average in earth science and chemistry.)
- In mathematics, there was no significant difference in the achievement scores of Ontario Grade 8 boys and girls.
- In science, there was a significant difference between the performance of Grade 8 boys and girls (in favour of boys) in Ontario overall and Ontario English overall. Boys' achievement was higher than that of girls in the following content areas: earth science (English and French), physics (English), chemistry (English) and environmental and resource issues (English and French).
- In both mathematics and science overall, the achievement of Ontario

Grade 8 students improved by a statistically significant margin between 1995 (TIMSS) and 1999 (TIMSS-R). Apart from science in Quebec, no significant changes were found in the other four provinces that over-sampled.

What EQAO Learned about Attitudes and Behaviour

- Nearly 89 percent of Ontario English-language Grade 8 students and about 39 percent of Ontario French-language students reported they always or almost always speak the language of the test at home.
- Ontario Grade 8 students held relatively positive attitudes toward mathematics and science as compared with their counterparts across Canada and internationally. The following two charts illustrate this finding.

What EQAO Learned about the Learning Context

- Comparing the TIMSS-R test items with *The Ontario Curriculum, Grades 1-8: Mathematics*, Ontario Grade 8 students should have been taught the content required by the mathematics items except for formal deductive demonstrations of geometric relationships; sine, cosine and tangent in right-angle triangles; scales applied to maps and models; and solving simultaneous equations in two variables. This means that about 93% of the TIMSS-R content was covered by the elementary school curriculum in Ontario.
- With respect to science, Ontario Grade 8 students should have been taught the material required by approximately 60% of the TIMSS-R test items; the content related to the remaining items is presented to students in subsequent grades.

The following findings about the learning context relate to the results for Canada overall and are summarized from the TIMSS-Canada Report.¹

- Internationally, the average class size was 31 for both mathematics and science. The average class size in Canada was 27 for both subjects. Within Canada, the largest classes were in Quebec where the average class size was 29. In the other four provinces, average class sizes ranged from 25 to 27.

¹ Robitaille, D.F. & Taylor, A.R. (2000). *TIMSS-Canada Report, Volume 5: New Findings for a New Century*. Department of Curriculum Studies, University of British Columbia.

Students' Attitudes toward Mathematics (percentage agreement)

	<i>Canada</i>	<i>Int'l</i>	<i>AB</i>	<i>BC</i>	<i>NF</i>	<i>ON</i>	<i>QC</i>
I enjoy learning mathematics.	63	66	67	64	72	75	47
Mathematics is boring. (reverse scale)	42	37	47	52	42	37	38
Mathematics is an easy subject.	47	40	47	45	53	48	45
Mathematics is important to everyone's life.	94	91	92	92	96	96	95
I would like a job that involved using mathematics.	48	51	42	43	46	56	44

Students' Attitudes toward Science (percentage agreement)

	<i>Canada</i>	<i>Int'l</i>	<i>AB</i>	<i>BC</i>	<i>NF</i>	<i>ON</i>	<i>QC</i>
I enjoy learning science.	67	76	74	78	70	73	55
Science is boring. (reverse scale)	39	30	40	37	39	36	40
Science is an easy subject.	47	49	53	53	45	41	48
Science is important to everyone's life.	77	81	77	81	86	82	67
I would like a job that involved using science.	45	53	48	47	49	48	37

- The data indicate that calculators are widely used in Canadian classrooms at this grade level and are more prevalent than in many other countries. Seventy-nine percent of Canadian students and teachers reported a "high use" of calculators. ("High use" meant that students reported using calculators in mathematics classes often or very often, and teachers reported students using calculators at least once or twice a week.) The international median for "high use" was just 18 percent. Within Canada, Alberta and Quebec reported the highest usage (91 and 86 percent, respectively); Ontario reported 70 percent.
- Regarding mathematics homework, the Canadian experience is similar to most other countries'. Most students at this grade level have some mathematics homework several times a week, but there is not a "high degree" of emphasis on homework. ("High degree" meant that a teacher assigned more than 30 minutes of homework at least three times a week.) Sixteen percent of Canadian students are in classrooms where there is a "high degree" of emphasis on mathematics homework.
- Few countries reported a "high degree" of emphasis on science homework. In Canada, 90 percent of Grade 8 students are in classrooms where science homework is assigned regularly, but few students are in classrooms where science homework is assigned almost daily.
- Fifty-seven percent of Canadian Grade 8 students reported having Internet access at home, as compared with 18 percent internationally. Canadian students had the highest rate of Internet access at school, 87 percent. Internationally, the average rate of Internet access at school was 25 percent. The vast majority of students reported that computers and the Internet were seldom used by their teachers in mathematics or science classes.
- Teachers in Canada use experiments in their science classes slightly more than teachers in most other countries. Almost one-half of Canadian teachers at this grade level reported giving a "high level" of emphasis to experiments, while the international average was 38 percent.
- At the Grade 8 level, most countries, including Canada, provide the same curriculum for all students in both mathematics and science. Teachers in a few countries (e.g., the Czech Republic and England for mathematics and science and Israel for mathematics) reported using different levels of the same curriculum for student groups at different levels of ability.
- The average number of instructional days, internationally, was 193 days. Canada reported an average of 188 days; the US reported 180. At the upper end, Indonesia reported 251 days, Korea, 225, and Japan reported 223 instructional days.

- The average number of instructional hours devoted to mathematics internationally was 129 per year. The Canadian average was 150, among the highest reported.
- The average number of instructional hours for science internationally was 115. In Canada, the average was 113 hours.
- The following two charts indicate the extent to which teachers of the TIMSS-R students used several kinds of instructional behaviours in their mathematics and science teaching.

Comparisons with Other Jurisdictions

The following charts present summaries of how the mathematics and science achievement of students in the five Canadian provinces, as well as those in other countries, compared to that of Canadian and Ontario students overall. The jurisdictions are divided into three groups: those whose overall mean score was significantly higher than the Canadian/Ontario mean, those whose overall mean score was essentially the same as the Canadian/Ontario mean and those whose overall mean score was significantly lower than the Canadian/Ontario mean. (The expression "significantly higher/lower," as used in this report, means that in 19 cases out of 20 (95% of the time), a difference of this size indicates a true difference and not one attributable to chance.) Countries are arranged alphabetically within each group to emphasize that differences between them may be too small to be considered important.

Percentage of Mathematics Teachers Who Use Problem-Solving or Reasoning Strategies in Every Lesson or in Most Lessons, in Canada and Internationally

<i>Teachers ask students to</i>	<i>Canada</i>	<i>Int'l</i>
Explain the reasoning behind an idea	76	70
Represent and analyze relationships using tables, charts or graphs	20	26
Work on problems for which there is no immediately obvious solution	18	21
Write equations to represent relationships	44	43
Practice computational skills	64	73

Percentage of Science Teachers Who Use Problem-Solving or Reasoning Strategies in Every Lesson or in Most Lessons, in Canada and Internationally

<i>Teachers ask students to</i>	<i>Canada</i>	<i>Int'l</i>
Explain the reasoning behind an idea	85	68
Represent and analyze relationships using tables, charts or graphs	35	33
Work on problems for which there is no immediately obvious solution	17	13
Write explanations about what was observed and why it happened	78	48
Put events or objects in order and give a reason for the organization	36	34

Countries' and Provinces' Mathematics Achievement Compared to Canada's¹

<i>Results Significantly Higher than Canada's</i>	<i>Results the Same as Canada's</i>	<i>Results Significantly Lower than Canada's</i>
Belgium (Flemish) 56 (0.3)	Alberta 53 (0.4)	Chile 39 (0.4)
Hong Kong 58 (0.4)	Australia 53 (0.5)	Cyprus 48 (0.2)
Japan 58 (0.2)	British Columbia 52 (0.6)	England 50 (0.4)
Korea 59 (0.2)	Bulgaria 51 (0.6)	Indonesia 40 (0.5)
Quebec 57 (0.5)	Czech Republic 52 (0.4)	Iran 42 (0.3)
Singapore 60 (0.6)	Canada 53 (0.3)	Israel 47 (0.4)
Taiwan 59 (0.4)	Finland 52 (0.3)	Italy 48 (0.4)
	Hungary 53 (0.4)	Jordan 43 (0.4)
	Malaysia 52 (0.4)	Latvia 51 (0.3)
	Netherlands 54 (0.7)	Lithuania 48 (0.4)
	Ontario (All) 52 (0.3)	Macedonia 45 (0.4)
	Ontario (Eng) 52 (0.3)	Moldova 47 (0.4)
	Slovak Republic 53 (0.4)	Morocco 34 (0.3)
	Slovenia 53 (0.3)	Newfoundland 50 (0.6)
	Russia 53 (0.6)	New Zealand 49 (0.5)
		Ontario (Fr) 51 (0.3)
		Philippines 35 (0.6)
		Romania 47 (0.6)
		South Africa 28 (0.7)
		Thailand 47 (0.5)
		Tunisia 45 (0.2)
		Turkey 43 (0.4)
		United States 50 (0.4)

¹ Mathematics achievement scale scores are provided for each jurisdiction; standard error statistics are provided in parentheses. The 95% confidence interval for each jurisdiction can be calculated by adding and subtracting two standard errors to and from each reported mean score. This means that we can be 95% sure (19 times out of 20) that the true mean for a given jurisdiction lies within the confidence interval. If the confidence intervals of two jurisdictions overlap, we can conclude there is no statistically significant difference in their achievement scores.

The achievement scale scores and standard error statistics in the above chart are rounded figures; consequently, a few jurisdictions may appear to be incorrectly grouped. However, the groupings above are accurate and reflect the international scale scores with means of 500.

Countries' and Provinces' Mathematics Achievement Compared to Ontario's²

<i>Results Significantly Higher than Ontario's</i>	<i>Results the Same as Ontario's</i>	<i>Results Significantly Lower than Ontario's</i>
Belgium (Flemish) 56 (0.3)	Alberta 53 (0.4)	Chile 39 (0.4)
Hong Kong 58 (0.4)	Australia 53 (0.5)	Cyprus 48 (0.2)
Hungary 53 (0.4)	British Columbia 52 (0.6)	England 50 (0.4)
Japan 58 (0.2)	Bulgaria 51 (0.6)	Indonesia 40 (0.5)
Korea 59 (0.2)	Canada 53 (0.3)	Iran 42 (0.3)
Netherlands 54 (0.7)	Czech Republic 52 (0.4)	Israel 47 (0.4)
Quebec 57 (0.5)	Finland 52 (0.3)	Italy 48 (0.4)
Singapore 60 (0.6)	Latvia 51 (0.3)	Jordan 43 (0.4)
Slovak Republic 53 (0.4)	Malaysia 52 (0.4)	Lithuania 48 (0.4)
Taiwan 59 (0.4)	Newfoundland 50 (0.6)	Macedonia 45 (0.4)
	Ontario (All) 52 (0.3)	Moldova 47 (0.4)
	Ontario (Eng) 52 (0.3)	Morocco 34 (0.3)
	Ontario (Fr) 51 (0.3)	New Zealand 49 (0.5)
	Slovenia 53 (0.3)	Philippines 35 (0.6)
	Russia 53 (0.6)	Romania 47 (0.6)
		South Africa 28 (0.7)
		Thailand 47 (0.5)
		Tunisia 45 (0.2)
		United States 50 (0.4)

² Mathematics achievement scale scores are provided for each jurisdiction; standard error statistics are provided in parentheses. The 95% confidence interval for each jurisdiction can be calculated by adding and subtracting two standard errors to and from each reported mean score. This means that we can be 95% sure (19 times out of 20) that the true mean for a given jurisdiction lies within the confidence interval. If the confidence intervals of two jurisdictions overlap, we can conclude there is no statistically significant difference in their achievement scores.

The achievement scale scores and standard error statistics in the above chart are rounded figures; consequently, a few jurisdictions may appear to be incorrectly grouped. However, the groupings above are accurate and reflect the international scale scores with means of 500.

Countries' and Provinces' Science Achievement Compared to Canada's³

<i>Results Significantly Higher than Canada's</i>	<i>Results the Same as Canada's</i>	<i>Results Significantly Lower than Canada's</i>
Alberta 56 (0.5)	Australia 54 (0.4)	Chile 42 (0.4)
Hungary 55 (0.4)	Belgium (Flemish) 54 (0.3)	Cyprus 46 (0.2)
Japan 55 (0.2)	British Columbia 54 (0.5)	Indonesia 44 (0.5)
Korea 55 (0.3)	Bulgaria 52 (0.5)	Iran 45 (0.4)
Singapore 57 (0.6)	Canada 53 (0.2)	Israel 47 (0.5)
Taiwan 57 (0.4)	Czech Republic 54 (0.4)	Italy 49 (0.4)
	England 54 (0.5)	Jordan 45 (0.4)
	Finland 54 (0.4)	Latvia 50 (0.5)
	Hong Kong 53 (0.4)	Lithuania 49 (0.4)
	Netherlands 55 (0.7)	Macedonia 46 (0.5)
	Ontario (All) 52 (0.3)	Malaysia 49 (0.4)
	Ontario (Eng) 52 (0.3)	Moldova 46 (0.4)
	Quebec 54 (0.5)	Morocco 32 (0.4)
	Russia 53 (0.6)	Newfoundland 53 (0.6)
	Slovak Republic 54 (0.3)	New Zealand 51 (0.5)
	Slovenia 53 (0.3)	Ontario (Fr) 48 (0.4)
		Philippines 35 (0.8)
		Romania 47 (0.6)
		South Africa 24 (0.8)
		Thailand 48 (0.4)
		Tunisia 43 (0.3)
		Turkey 43 (0.4)
		United States 52 (0.5)

³ Science achievement scale scores are provided for each jurisdiction; standard error statistics are provided in parentheses. The 95% confidence interval for each jurisdiction can be calculated by adding and subtracting two standard errors to and from each reported mean score. This means that we can be 95% sure (19 times out of 20) that the true mean for a given jurisdiction lies within the confidence interval. If the confidence intervals of two jurisdictions overlap, we can conclude there is no statistically significant difference in their achievement scores.

The achievement scale scores and standard error statistics in the above chart are rounded figures; consequently, a few jurisdictions may appear to be incorrectly grouped. However, the groupings above are accurate and reflect the international scale scores with means of 500.

Countries' and Provinces' Science Achievement Compared to Ontario's⁴

<i>Results Significantly Higher than Ontario's</i>	<i>Results the Same as Ontario's</i>	<i>Results Significantly Lower than Ontario's</i>
Alberta 56 (0.5)	Bulgaria 52 (0.5)	Chile 42 (0.4)
Australia 54 (0.4)	Canada 53 (0.2)	Cyprus 46 (0.2)
Belgium (Flemish) 54 (0.3)	Hong Kong 53 (0.4)	Indonesia 44 (0.5)
British Columbia 54 (0.5)	Latvia 50 (0.5)	Iran 45 (0.4)
Czech Republic 54 (0.4)	Newfoundland 51 (0.6)	Israel 47 (0.5)
England 54 (0.5)	New Zealand 51 (0.5)	Italy 49 (0.4)
Finland 54 (0.4)	Ontario (All) 52 (0.3)	Jordan 45 (0.4)
Hungary 55 (0.4)	Ontario (Eng) 52 (0.3)	Lithuania 49 (0.4)
Japan 55 (0.2)	Russia 53 (0.6)	Macedonia 46 (0.5)
Korea 55 (0.3)	United States 52 (0.5)	Malaysia 49 (0.4)
Netherlands 55 (0.7)		Moldova 46 (0.4)
Quebec 54 (0.5)		Morocco 32 (0.4)
Singapore 57 (0.8)		Ontario (Fr) 48 (0.4)
Slovak Republic 54 (0.4)		Philippines 35 (0.8)
Taiwan 57 (0.4)		Romania 47 (0.6)
Slovenia 53 (0.3)		South Africa 24 (0.8)
		Thailand 48 (0.4)
		Tunisia 43 (0.3)
		Turkey 43 (0.4)

⁴ Science achievement scale scores are provided for each jurisdiction; standard error statistics are provided in parentheses. The 95% confidence interval for each jurisdiction can be calculated by adding and subtracting two standard errors to and from each reported mean score. This means that we can be 95% sure (19 times out of 20) that the true mean for a given jurisdiction lies within the confidence interval. If the confidence intervals of two jurisdictions overlap, we can conclude there is no statistically significant difference in their achievement scores.

The achievement scale scores and standard error statistics in the above chart are rounded figures; consequently, a few jurisdictions may appear to be incorrectly grouped. However, the groupings above are accurate and reflect the international scale scores with means of 500

Appendix A

The following table, taken from *The Ontario Curriculum, Grades 9 to 12: Program Planning and Assessment, 2000* (published by the Ministry of Education), provides a summary description of achievement in each percentage grade range and the corresponding level of achievement.

Percentage Grade Range	Achievement Level	Summary Description
80-100%	Level 4	A very high to outstanding level of achievement. Achievement is <i>above</i> the provincial standard.
70-79%	Level 3	A high level of achievement. Achievement is <i>at</i> the provincial standard.
60-69%	Level 2	A moderate level of achievement. Achievement is <i>below but approaching</i> the provincial standard.
50-59%	Level 1	A passable level of achievement. Achievement is <i>below</i> the provincial standard.
Below 50%		Insufficient achievement of curriculum expectations. A credit will not be granted.